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THE AMERICAN MUSEUM JOURNAL

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(New York City, 1918)

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**SAMUEL WENDELL WILLISTON, PROFESSOR OF PALÆONTOLOGY IN THE UNIVERSITY
OF CHICAGO AT THE TIME OF HIS DEATH, AUGUST 30, 1918**

Although Professor Williston preferred scientific investigation, the influence of his work as an educator was even greater than that of his writings; and yet few modern scientific men have left so brilliant a record of achievement in such varied subjects. Paleontology, geology, entomology, and comparative anatomy all have been greatly enriched by his indefatigable zeal and his investigations

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A League of Free Nations¹

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TION AND RAPID TRANSPORTATION OF RESOURCES.—LAWS OF
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ATIVE WORLD ORGANIZATION WILL MEAN
ULTIMATE WORLD PEACE

By CHARLES R. VAN HISE

President of the University of Wisconsin

GERMANY, Austria, Bulgaria, and Turkey have all urgently asked for armistices. By the Allies the conditions of ceasing to press their highly successful attacks have been given, and have been accepted by all the powers named. The conditions are so drastic that hostilities cannot possibly be resumed. The accepting powers must submit to the terms of peace imposed upon them by the Allies, however severe they may be. The war is won.

If, when the terms of peace have been concluded, some way has not been worked out so that gigantic wars will not recur, we shall be obliged to conclude that the human being has not traveled sufficiently far along the road of rationalism to have learned even by the most bitter and costly experience.

The proposal which has met general approval for preventing war is a League of Nations; or, to introduce a recent qualification, a League of Free Nations. The President of the United States and the premiers of Great Britain are definitely committed to a League of Nations, and high officials of France, Italy, and Japan have ex-

pressed warm sympathy with the principle.

The League must be created as an integral part of the terms of peace. This is the golden opportunity. If it be allowed to slip away and each of the allied nations again devotes itself exclusively to its own interests, it will then be very difficult to form an effective league. Now, when the allied nations are acting together in all that relates to the prosecution of the war and the terms of peace, is the time that they are most likely to agree upon obligations to prevent the recurrence of wars.

In regard to the covenants of the League, proposals have been made ranging from a complete United States of the World to an alliance with vague and general obligations. A number of interesting plans have been worked out for the United States of the World, but so far as I have met men in this and other countries—and my opportunities in England have been exceptionally fortunate—I know of no man who believes that a "United States of the World" is now a practicable proposal. If, in the future, there is such an organization, it will be a growth. Therefore I shall con-

¹ Opening address before the Wisconsin State Convention of the League to Enforce Peace, November 8, 1918.

sider the problem of a League of Nations from the minimum rather than the maximum point of view.

What are the minimum obligations which the nations entering into a free league will be willing to accept, but which will be sufficient to make the league effective for the purpose for which it is primarily created—the prevention of war?

All the proposals that I have seen concerning a League of Nations provide for a separation of cases arising between the members of the League into two classes: justiciable and nonjusticiable. All agree that justiciable cases should go to a regularly constituted court, either the existing Hague court, or a new court formed directly under the League.

For the nonjusticiable cases it is agreed that in the case of a difference between two nations which they themselves are unable to settle, they shall not go to war with each other until the members of the League not parties to the controversy have had the grounds of difference investigated and have made recommendations for settlement.

The method of reaching the recommendations raises the question of the nature of the organization of the League. It is suggested that it will be advisable for the body created by the direct representatives of the nations in the League to confine itself to essentially legislative functions. This body should control policies; it should create instruments and agents to carry out these policies. The actual work should be done by these instruments and agents. A League of Nations composed of a considerable number of members could well consider and control policies. It could not wisely undertake the investigation of a difference between two nations and make recommendations concerning the same. These duties should be performed by a quasi judicial body analogous to a commission.

Presuming, therefore, that the inves-

tigation in any case will be made by a commission or council appointed by the members of the League not parties to the controversy, its recommendations, whether unanimous or by majority, must be final, precisely as the determination of a court, whether unanimous or by majority, is final. To require that the recommendations of a tribunal shall be unanimous, or after their consideration by the members of the League the League itself shall be unanimous, as has been seriously proposed, would be a decision at the outset to make the League of Nations futile.

The case of the nobles of Poland, who acted under the principle of unanimity with calamitous consequences to that country for more than a century, is a conclusive illustration. On the other hand, the acceptance by the American people of the decisions of the Supreme Court of the United States, often with a bare majority, upon most momentous questions, some of these between the several states during the early years of the Union when the states were being cemented into a nation, is conclusive evidence of the soundness of the principle advocated.

The next question that arises is what is to happen if a nation of the League goes to war contrary to the recommendations made. It has been proposed, indeed strongly urged, by many who are advocating a League of Nations that all members of the League shall bind themselves in such a case to support the attacked state with their armies and navies and also economically.

It does not seem to me that it will be practicable to obtain the agreement of the nations to such a condition, and I therefore propose as a substitute that they agree that any nation in the League shall be free, if it so desire, to support the attacked state with its army and its navy; and that all the members of the League agree absolutely to boycott the offending nation, to have no trade or communication with it in any

way whatever, to treat it as an outlaw among the free peoples of the world.

So dependent are nations upon one another in these days of instantaneous communication, rapid transportation, and international commerce, that it seems to me any nation would be very slow to go to war contrary to recommendations which had been made upon its case, with the certainty that the war would have to be prosecuted entirely upon its own resources, that no help could be derived in any way from any other nation: not only so, but that in relations other than war, it would be treated as a leper.

In regard to differences between states that are members of the League, and states not members of the League, the League of Nations should be free to follow precisely the same procedure as though both nations were members of the League; and whether or not the nation outside the League requested it, the League should take steps for the investigation of differences and the making of recommendations. If the nation outside the League attacked a nation within the League before the case was investigated and recommendations made, or contrary to the recommendations, then, again, the nations of the League should be free to support their ally with their armies and navies and should be bound to support it by complete boycott of the offending state.

In the case of a controversy between two nations altogether outside the League, probably it is not wise to propose that the League should do more than tender its good offices to settle the difference which threatens war, precisely as if the two states were members of the League. This offer might not always be accepted; but if it were accepted by one state and not accepted by the other, it is inevitable that the state that was attacked contrary to the recommendation would have at least the moral support and influence of the nations of the League; and no war has ever illus-

trated the mighty power of moral support as has this war which is just being finished.

The second fundamental point upon which agreement must be reached by the League of Nations is in regard to armaments. At the end of this war, the great nations involved will have mighty armaments upon land and sea. They have maintained these armaments by borrowing enormous sums of money. After the termination of the war, the current expenses for any country must be reduced to the income derived from taxation; and that income must in addition provide for the interest upon the colossal war debt, and if possible some increment toward liquidation. It is therefore clear that armaments as they exist at the end of the war cannot be maintained. They must be reduced, however jingoistic a nation may be. It is obvious that it cannot be proposed that armaments shall be equal for all nations. It cannot be suggested that Liberia and Great Britain shall have armies and navies of the same size. The reduced armaments should be proportioned to the importance and power of the nations.

As a first approximation toward this, we may suggest that the disarmament be proportioned, and that the disarmament under this principle be carried as far as possible. To illustrate for the navies: Great Britain at the end of the war will have a fleet upon the sea substantially three times that at the beginning of the war. To maintain a fleet in times of peace is almost as expensive as during war. The men must be paid, the ships kept in repair. It should therefore be agreed that the British sea-going fleet shall be reduced to say one third, one fourth, one fifth, one tenth, or any other fraction which may be decided upon, of the power of the fleet at the end of the war; the reduction to apply so far as practicable to each class of ships. In regard to the ships which are put out of commission, the guns

would be dismantled, and the ships placed at anchor in the harbors. In case of necessity they would be available rapidly. The proportion agreed upon would apply to the United States and to all other members of the League.

The proportional reduction of armies is not so easy to illustrate in simple terms, but the principle of armaments in proportion to power and influence should be applied so far as practicable.

It is to be noted under the principle of proportional disarmament that each nation would have the same relative power it possessed before such action. I am glad to be able to state that Lloyd George supports the principle of proportional disarmament. In the majority of proposals which have been made, it has been provided that all the free nations that desire to enter a League may do so. A League thus formed would consist of many nations. Recognizing the very great difference in the strength and influence of the members of such a group of nations, various schemes have been suggested for proportional influence; but all the schemes, it seems to me, present insuperable difficulties because of the pride of nations of intermediate power and influence. These would claim as their right the same position as the first-class powers.

It therefore appears to me that to form a League of Nations which shall at the outset include all the free nations that wish to enter is inadvisable. The League of Nations should at first consist of the free nations that have borne to the end the larger part of the burden of this war against autocracy, namely, the United States, England, France, Italy, and Japan. The organization of such a League under the principles above given, even if it included no other nation, would go far toward sustaining the future security of the world. Even covenants to the extent above outlined of the English-speaking peoples would be a mighty influence in that direction. If the League of Free Nations

is first limited to the five powers named, the difficulties in regard to representation are overcome. They will have equal representation. The difficulties of disarmament are largely overcome. These nations have acted together; their interests are common; they are in sympathy. They will work out a plan under the general principle of proportioned disarmament, maintaining in the aggregate a power sufficient to secure the peace of the world. The League of the five nations once formed, other nations would be admitted under the constitution of the League, and they would have the rights and powers given them under that constitution.

A question which immediately arises is, Shall Germany, which country is already committed to the principle of a League, be admitted under the terms of its constitution?

My answer is that as soon as the German people have shown that they are a free people, wholly independent of autocracy, have completely abandoned the evil doctrine of "Might," and are ready to support the existence of a moral order in the world, that nation should become a member of the League of Free Nations. This would mean that Germany, once admitted to the League in the matter of armaments as well as others, should be treated upon the same basis as the other five powers. But there should be the strictest guaranties that the agreements will not be surreptitiously disregarded. If Germany is allowed unduly to expand her armie, this will start again in the world the race for enormous armaments.

Another question that arises in connection with the admission of Germany to the League is the economic treatment of the Central Powers after the war. In this matter, to my mind, there are two phases, that of reconstruction and that of a permanent policy following reconstruction. It is possible, indeed probable, that during the period of reconstruction, there will be a shortage of

essential materials. I hold that during this period the needs of the Allies must have preference, since the restoration of Belgium, France, and Serbia has been made necessary in large measure because of the ruthless and unlawful acts of the Central Powers.

Following the reconstruction period, when the world has assumed its normal condition, the Central Powers should be placed upon precisely the same economic basis as are other nations. Each nation, with regard to tariff and similar policies, will retain its own autonomy; but the League of Nations must see that no nation within the League which has equal treatment with regard to raw materials, shall pursue unfair practices in international trade. In short, unfair practices in international trade, illustrated by dumping, must be outlawed, precisely as are unfair practices in national trade. In this respect Germany has been an offender in the past; and only when she reforms completely, shall she have the same treatment as other nations with regard to raw materials.

In making the above statement, I wish it clearly understood that if I were in a position of power, I should be implacable in imposing upon Germany, to the utmost limit she is able to bear them, the full penalties for all actions she has taken contrary to international law. When peace has been concluded, the sanctity of international law must be reestablished. The small nations which have been outraged contrary to international law, so far as possible must be reimbursed for all the wrongs they have suffered. This position is not taken with the idea of revenge, but from the point of view of justice and the necessity of convincing every German that all violations of international law will carry their inexorable penalties.

There is not space and it is not appropriate for me to discuss the further terms of peace. They undoubtedly will be severe. Having been imposed, however, and the penalty having been ex-

acted, the past should be eliminated from further consideration and a course of justice pursued. Only so can there be permanent peace in the world. It cannot be denied that the Germans are a great people, and that, if permanently kept out of a League of Nations, Germany will be the center of another group of nations; and we shall have the old balance of power between the League of Free Nations and another League of Nations led by Germany. There can be no permanent peace which does not include finally all the great nations of the world in the League of Free Nations.

In accordance with the ideas of General Smuts recently expressed at a dinner in England, I hope that the world of the future may be a free world, an organized world (that is, with a League of Nations), and a friendly world.

In order that the League of Free Nations shall have permanence and its influence grow, it is necessary that it have something to do. In the matter of justiciable cases this is provided for. The nonjusticiable cases would be sporadic. They would doubtless be handled as they arose by appropriate agents, appointed for the purpose. The terms of peace, however, are likely to require a number of international obligations. It is clear that the Dardanelles must be made open to the peoples of the world; they must be internationalized. It is generally believed that the German African colonies should not be returned to that country. With the exception of southwestern Africa, the administration of these colonies in the interest of their peoples might well become an international obligation. New states have been created through the disintegration of Russia and will be created by the disintegration of Austria. It will be necessary that these states have a big brother to assist them when needful until they get on their feet, precisely as the United States served as a big brother for Cuba until she was

able to act independently. This is international work. It seems to me that this function should be exercised directly through the League of Free Nations. An organization should be created by it to handle international responsibility in the interests of the world. This will involve the setting up of an appropriate government in each case, the apportioning of the necessary protection, and the allocation of the required funds among the members of the League. From time to time, as need arises, a helping hand should be given, but always with the purpose of developing a province exclusively in the interests of its inhabitants, and when the time comes, of establishing self government.

The foregoing discussion assumes that the United States will become one of the great nations of the Free League. Already in this war, the United States has abandoned the policy of isolation and has acted in practical alliance with the great powers fighting Germany. In every respect in the conduct of the war the United States has acted precisely as have the other members of the alliance. Indeed the United States has taken leadership in making the alliance stronger and firmer through a common command of the fighting forces, through coöperation in the feeding of the Allies, and through apportionment of the materials of war.

In the second place, even if we had not already abandoned the policy of isolation, sooner or later it would have been necessary to do so under the conditions of the modern world. The policy may have been wise when the Atlantic Ocean was a great gulf between America and Europe. Transportation and communication were so slow that the United States could pursue policies independent of those followed in Europe. Now, however, that communication is instantaneous and transportation so rapid that goods cross the Atlantic in less than a week, and the trade of each

nation depends upon materials derived from other nations, isolation is no longer possible. The world has become one body, and no great member of it can proceed independently of the other members. They must act together; and this is possible only through formal treaty covenants.

It seems clear that if the United States now shirks the responsibility of entering the League of Free Nations, it is inevitable that some time in the future she will again be obliged to intervene in a war for which she is in no way responsible and the initiation of which she has no means to control. Because of the intimate international relations, if a world conflagration again start, it is almost inevitable that we shall be drawn into it precisely as we were into this.

Finally it should be pointed out that the proposal to join a League of Free Nations is fundamentally different from joining an alliance of the kind which was meant when the doctrine of avoiding entangling alliances was developed. The danger of joining an alliance is that this alliance will get into armed conflict with another alliance. The plan of balance of powers between alliances in Europe we know has led to disastrous wars from time to time. If it were proposed that the United States should enter into an alliance with one or two powers of Europe, the objection would hold that it would be entering into an entangling alliance; but the proposal is that the United States shall enter a League of Free Nations which shall, at the outset, include the great dominant free nations, and which shall finally include practically all nations. This is not an alliance, but a step toward co-operative world organization, and therefore World Peace. Not only should the United States enter the League of Free Nations, but she should take the position of leadership in its formation to which she is entitled by the commanding influence she is exercising at the present time in the councils of the world.



The well-kept space encircled by a hundred huts is the "stadium" of Mangbetuland, over which tower the groves of oil palms—an imposing setting for Okondo's great residence. Here, at the king's bidding, the quiet of peace gives way to the turmoil of barter, to shrewd appeals of crafty justice, to riotous gatherings of pleasure, or to turbulent waves of war. Those who are welcome are invited to pass the forbidden gates to the king's harem; but woe to those who are subject to the cruel dictum of his tribunal

Famous Ivory Treasures of a Negro King

By HERBERT LANG

The ethnographical collection, a small part of the 54 tons of natural history material brought home by the Congo Expedition (1909-1915), comprises about 3800 examples representative of the culture of the Mangbetu and neighboring tribes. More than 1000 photographs, including a series of portraits and illustrations of habits and customs, plans of villages and houses, together with water color studies of mural painting, and more than 100 life masks, form a splendid contribution to the better knowledge of these little-known peoples. The jewels of the collection are 380 pieces of carved ivory, beautiful in design and remarkable in execution, all denoting a keen sense for well-balanced composition. These ivories are now on exhibition in the Morgan hall of the American Museum of Natural History, and although made by untutored savages they harmonize surprisingly well with displays of art treasures exhibited near them which have come from many lands. This collection is particularly valuable inasmuch as it cannot be duplicated, for Okondo, king of the Mangbetu, died in 1916, three years after we left him, and for administrative reasons his realm was divided among many smaller chiefs who more easily can be made to abide by the golden rule of civilization. These chiefs, being virtually without authority, possess comparatively few show pieces; nor can they offer inducements to artists in this line, as ivory is now scarce.

These Mangbetu ivories astonish even modern artists of civilization. The unusual amount of care the savages have bestowed upon their work is as surprising as the range and adaptability of the conventionalized subjects chosen. Man occurs as often as purely geometric compositions, but curiously enough, animal forms are seldom admitted. The carved form of the human head in miniature as a terminating figure for an ivory piece is especially common, sometimes in natural proportions but more often lengthened or flattened either to an extreme extent or cleverly suggested by only a few sharp lines.

Those who enjoy the beauty of the Mangbetu ivories are indebted in a large measure to the president of the American Museum of Natural History, Professor Henry Fairfield Osborn, who by his liberal plans and generous encouragement made possible the gathering of so unique a collection, although the chief errand of the expedition was zoölogical.—THE AUTHOR.

THE first decorative use of ivory dates back to the cave men of the Old Stone age. Their artistic inclination was forceful enough to guide the historian's sharp-pointed

flints over the smooth surface of tusks. About eighteen thousand years ago primitive artists of France thus recorded stories of animals they hunted and dangers they escaped. One of the

earliest masterpieces, preserved from the Magdalenian period, successfully pictures, in realistic sharp-cut lines, a spirited charge of woolly mammoths.¹ Ever since, craftsmen of all races have been encouraged to use ivory as a substance fitted for the expression of the beautiful. Their success is proof conclusive of the fascinating possibilities this rich material has offered to a remarkable variety of tastes, and its continued association with the costliest metals and even precious stones shows the high favor in which it has been held. Neither the relative rarity, nor the naturally small proportions of tusks, succeeded in imposing restrictions—as is proved by the colossal gold and ivory statues of ancient Greece.² Monuments of deities and rulers, thrones, chariots, and scepters, and the broad field of religious art accorded it prominence long before ivory was found to be a suitable material for billiard balls and modern trinkets.

America, champion of democracy, long ago gave the alien negro a full-fledged citizenship; but, strange to say, she has evinced small interest in the study of the native African and therefore knows relatively little of the high perfection to which he may attain along certain lines under the sway of powerful chieftains. As a race, it is true, the black man has often failed to profit by the processes of civilization offered in Africa. In the eastern part, which for centuries has been in contact with ancient and modern culture, one might at first be disappointed at the paucity of indigenous art. But who would expect niceties of this kind from tribes that barely succeeded in eking out a meager existence; and that were afflicted at the same time by the currents of slave trade

which swept over their country, with their destructive sequels? Other tribes, although more prosperous, were cattle owners, sometimes with seminomadic habits, conditions equally unsuitable for the development of artistic tendencies. Even so well-organized a people as the Waganda can claim no particular achievement in the realm of art.

The two great centers of true negro art were discovered only within the last few decades. They lie in Central Africa, along the fertile fringe of the huge, equatorial rain forests; in the south, the Kasai region; and in the northeast, the Uele district. Here, with a background of more settled conditions and a lavishness of natural resources, art has flourished. In many districts the powerful incentive of fetishism occasions a profusion of elaborate idols and offers a foundation for artistic wood carving, widely practised on account of its utilitarian character and an abundance of suitable timber. The favor in which negroes hold dances, in connection with drinking bouts, fosters the production of musical instruments such as gongs, drums, and clappers. A motley array of stools and a diversity of curious potteries and ornamented gourds are also in common use at such riotous gatherings, and it becomes apparent that the desire to arouse the admiration of friends by the possession of noteworthy pieces insures a healthy stimulus to this industry. The many queer shapes of hats, the pleasing patterns of mats and other wickerwork, a variety of elaborate hairdresses, and the complicated designs of raised tattoos show the wide range of their artistic tastes. Blacksmithing, too, is a craft in which extraordinary results are achieved. Some of the best work proves that the West African Bantu negro has a deep-rooted sense for decorative effect together with a great store of practical intelligence.

Although in many ways the natives of the Kasai show a higher develop-

¹ Their sundry achievements have been admirably dealt with in Professor Henry Fairfield Osborn's *Men of the Old Stone Age*. Charles Scribner's Sons, 1916.

² *Ivory and the Elephant*, by Dr. George Frederick Kunz, Doubleday, Page and Company, 1916, a standard work on this subject, representing the harvest of a great authority (p. 22).

ment in their art than the Mangbetu of the Uele, the latter rank foremost among negroes in the carving of ivory, which is so essentially connected with luxury.¹ Their kings alone, by continued encouragement of it, succeeded in building up so difficult an art. Their superiority in many other lines has been enthusiastically commented upon by the few explorers and travelers visiting their country.²

Living in the heart of Africa, eighteen hundred miles inland, far removed from trade routes, these people were shielded from foreign influence; and ethnological specimens illustrating their skill seldom reached civilized countries. These Mangbetu were cannibals of the worst repute. Under King Munza's reign (1870) they inhabited the fertile regions about the northeastern edge of the African rain forest and, toward the end of the last century, nearly lost their independence in a stubborn contest with the warlike Azande. Their kings claimed power over life and death and incidentally raised art to an extraordinarily high standard. Of all negro potentates not influenced by higher civilization, they boasted the greatest architects. Their dance halls, compared with ordinary negro huts, were gigantic palaces; one built during

our sojourn there measured 35 feet in height, 80 in width, and 200 in length. Artistic features were impressed upon every object, and the barbaric splendor of their court and the rigor of public ceremonies were as much a surprise to us as they had been to Schweinfurth. (We, fortunately, were spared the gruesome sight of piles of human skulls of devoured victims, lying about refuse heaps from the king's kitchen.) The veneration of the people for their autocratic chieftains is as overwhelming as their fear, and any object of beauty or value is offered speedily to them as a gift, for possession might mean ruin to its owner.

That the negro race produces a smaller number of superior men than other peoples becomes particularly evident in these regions. Perhaps it was the fact that these rulers surrounded themselves with the few men of talent and ability they could bring together that raised Mangbetu domination to such heights. No wonder thousands of subjects flocked to the court to see the spectacular exhibitions. Thus we can understand why tyrants, who daily slaughtered a dozen prisoners bound to the stake, to furnish meat for their household of hundreds of queens, would grant generous protection to artists. These, in turn, surrounded by a bewildering chaos of rapidly rising and falling destinies, had grave reasons to please their master, and naturally strove to outdo one another in eager competition. Credited by popular belief with supernatural acquisition of talent, they formed a small caste to which access could be gained only through initiation, and any one attempting to compete with them invited severe misfortune or forfeited his life. They even fashioned their own tools; thus the rude ax, the sharp chisels and blades, the rough saw, the handles and special tools, are their handiwork.

That a real industry never was built up cannot be imputed to these restric-

¹ The famous ivory carvings from the former negro kingdom of Benin, on the Niger delta, show a strong infusion of foreign influence, and can hardly be attributed to pure negro art. Nor can the natives of Loango (north of the mouth of the Congo) make any legitimate claim; for they are encouraged by traders and other white men to make processionally carved tusks, which sometimes are skillfully executed, but which represent a motley of European ideas badly jumbled in a negro's brain. At Stanleyville, in the Belgian Congo, I saw more than a hundred tusks carved in relief with subjects wending their way from the root toward the tip. Human beings, performing various feats, were the favorite subjects. Elephants, leopards, antelopes, crocodiles, lizards, butterflies, flowers, and leaves were rendered in poor, school-boy fashion. Since the exportation of small tusks is forbidden by law, these were transformed into works of art, exported to Antwerp, and from there sent to Khartum where they became Egyptian curios, to the delight of foreign visitors.

² Schweinfurth's able description has an added value, for in 1870 he lived at King Munza's court, which Junker, Emin Pasha, and Casati also visited. Boyd Alexander (1906) assisted at a dance, and Schubotz (1910) spent a fortnight there.



A FORMER PATRON OF ARTS IN THE CONGO

Three hundred and eighty pieces of carved ivory were gathered by The American Museum Congo Expedition. Many of these had been the treasure of Okondo, King of the Mangbetu, and others were made by artists of Mangbetu or Azande origin, and are now on exhibition in the American Museum. Okondo looked most spectacular in his dancing costume, which he always discarded immediately after the performance. His unusually dark torso was girded by stiff, Havana-brown bark cloth, held in place by belts especially consecrated. Graceful plumes of dark eagle and red parrot feathers crowned him impressively. A necklace of white beads, bunches of wart-hog bristles, skins of the lemur, and a strap of okapi hide denoted royalty and supposedly endowed him with occult powers. To him a dance meant the heroic effort of a star performer, and his endurance, agility, and display of splendor were famed abroad by hundreds of admiring subjects.

tions alone or to the proverbial indolence of negroes; the great obstacle to tribal intercourse in a land of cannibalism is the fact that travelers were considered "walking lumps of meat." Conditions had become so dangerous that men walking through the forest carried bows and poisoned arrows ready for emergency, and women would not venture abroad alone.

Thus the black man has received as little credit for attainments in carving ivory as for his ability to smelt and work iron; although lately he has been hailed by modern ethnologists as the inventor of the iron trade. The carvings of the Mangbetu show such technical perfection that the use of a lathe and other modern instruments suggests itself. After much consideration, they work without tracing a plan or indicating divisions, although apparently they have a fair idea of the final form. The tusk, or piece of ivory, is trimmed with a hatchet exactly as if it were hard wood. With an adz they shape the ruder outlines. An indented blade serves as a saw to cut the deeper moldings. The finer, ornamental features are carefully carved by variously shaped tools; and, finally, the whole is smoothed with the sharp edge of a knife. Foliage, from various trees, containing fine crystals of silica, is used like sandpaper: thus with a moistened leaf they produce the polish which so heightens the beauty of these ivories.¹

¹ The Mangbetu neither soak nor in any other way prepare ivory before or during carving. The straightening of small curved pieces, however, causes no perplexity. In the core of the juicy banana trunk they place the ivory to be bent. This succulent cylinder, nearly a foot in diameter, discharges steam from the center as it is turned over the fire until the exterior is completely charred. The ivory, thus exposed to a moist, intense heat, and yet well protected from the flames, is removed so hot that it can hardly be touched. Water is poured over the straightened piece which is then pressed between two logs. Bent ivory hatpins are easily straightened if put into a section of the fruit stalk of plantains and treated in the same manner. This process may be the key to the lost art of ancient Greece and perhaps explains the presence of extremely large, flat pieces of ivory required in the production of their colossal gold and ivory statues.

Imagine the uncouth figure of an ill-smelling, nearly nude negro bent over the immaculate, white substance, often holding the object with his feet to have his hands free, industriously hewing, carving, scraping, and polishing, while surrounded by a group of enthusiastic friends who spur on his desire for greater accomplishments. His one goal is to arouse the admiration of his fellow men whom he likes to surprise by changing the decorative features for every object. The translucent effect of the subtle, wavy lines and strange concentric rings appearing on the well-balanced forms of the ivories is ample reward for his diligence. The best of his creations he passes from hand to hand, for closer scrutiny brings out more fully their peculiar beauty. In fact, the delicate details stamp it as a labor of love and can be appreciated only by careful examination.

Through their contributions, these artists have unwittingly guided their race to a keener realization of the beautiful; and it is regrettable that the greedy trader² whom civilization sends with his machine-made, utilitarian goods, millions of them cast in the same mold, should completely supersede an exquisite art. In these regions, older chiefs often decline to wear the gaudy cotton goods "fit only for slaves"; they still strut about in the stiff, homemade "Malumba," a bark cloth peeled from their own fig trees. The deeply folded, Havana-brown material encircling their waists admirably fits the well-built, bronze torsos.

The day before our arrival at Okondo's court (November 5, 1910), and indeed throughout the following day, an army of runners assured us that "There is no greater king than

² Not until 1910 did Greeks and Hindus flock into the northeastern Uele offering so high a price for tusks that ivory soon became scarce. In former days only the larger tusks found their way into the markets of the world, but later the chiefs collected even the smaller ones, and thus articles of ivory were rapidly disappearing. In fact, we often had to buy the ivory the artists needed.

Okondo!" A large deputation greeted us about a mile from the royal residence, and we soon discovered the king—poor slave to fashion—clad in an officer's old, shabby uniform. Although satisfied that, in this part of Africa at least, the days of kings had passed, we had no reason to complain. We were fortunate! The medicine man's oracle had favored us and Okondo unhesitatingly announced that our relations would be friendly. The reception was most enthusiastic and his behavior was as stately as could be expected of a man with 180 wives. His queens craved salt—as much esteemed in Mangbetuland as candy in America—and were far less dignified than His Majesty. For a pinch of it they parted gladly with their entire costumes, small pieces of bark cloth and decorative aprons twice the size of a hand, substituting the delightfully cooling leaves of banana trees. I was not surprised when the king ordered them to their huts and, as an excuse, pointed to his garden, remarking that "a swarm of grasshoppers might have visited the banana trees." I gave his foremost queens "as much salt as he could not lick away in the next month."

Although we thoroughly enjoyed the horseplay of the first day, we did not realize the admirable resources of this people. Great dances were given in our honor, sham battles¹ were fought, hunting parties sent out, and artists convoked to court. And to such an extent did they all exert themselves that the splendor soon rivaled that of Munza's time. When we expressed our regret at the lack of the great halls made famous by Schweinfurth's account, the architects were bidden to proceed at once. We had to start northward toward the southern Sudan, and laughed incredulously as we handed the king, in advance, the gifts we had promised to assure his domestic peace during the

undertaking. Two loads of salt and one of brass wire for anklets and bracelets for his queens proved satisfactory. His promise was kept; one year as many as 500 men worked at the structure, of course with continual interruptions for dancing and drinking.

One might hope to find within the court large stores of ivory treasures accumulated for hundreds of years, as ivory by right belonged to the king. But at the death of a ruler barbarian custom demanded immediate destruction of his residence and all his property.² So it happens that only recent objects are found at the royal headquarters, and the Museum party was fortunate that, because of some superstition, the famous Okondo, last of these kings, was willing to part with the best he had, ordering other objects to be made by his most skilled artists. Old Queen Nenzima readily offered her advice in this task.

The great carved horns made of huge tusks naturally attract the attention

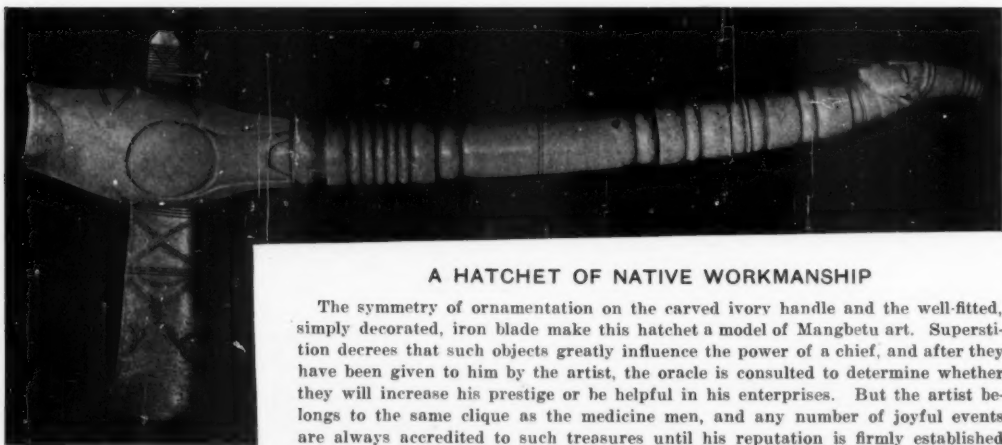
² Unfortunately tradition also required the wholesale butchery of the queens who did not succeed in escaping. Some of these intimate associates were buried with him to furnish cheer in the fields beyond, while others were served as the main course at the new king's inaugural feast. So great was the popular regard for Queen Nenzima, formerly one of the powers behind King Munza's throne, and now a dignified matron past her sixtieth year, that three times she had escaped death at the massacre of queens, following the demise of rulers. Most pathetic and significant was her answer to my reiterated question whether no art treasures remained from the three former kings over whose harems she had presided: "There is nothing left, not a single object, except myself. I am the only thing, such a very old thing. Do you want to take me home?" As a result of this interview, I was presented with a necklace of her extremely long finger and toe nails, an emblem of dignity, and especially cut to show her high regard. In their belief, even a single hair falling into the hands of an enemy gives him power over them. Courteously revealing this, she shrewdly added that were I to give her all the loads the expedition owned, I had but badly repaid her trust. I quickly offered part of my thumb nail, regretting its comparative shortness but assuring her that now she would have the same powers over my person that I enjoyed over her. Upon my return two years later, her nails had grown again to a considerable length, and a second necklace cost me another finger nail which she wears on her bracelet (concealed in the hollow of a small wooden cylinder); her gifts to me are destined to show Museum visitors how long the nails of Mangbetu queens can grow.

¹ AMERICAN MUSEUM JOURNAL, Vol. XI (1911), pp. 190-191.



QUEEN NENZIMA OF MANGBETULAND

Nenzima was the foremost of Okondo's one hundred and eighty wives, and is more than sixty years of age. She has been queen during four reigns, and is the beloved mother of her tribe. The abrupt changes from glory to nothingness that follow wars and revolutions have failed to dim her fame. Endowed with great wisdom, she is renowned as a debater in court; the righteousness of her motives lends her sufficient daring to oppose rudeness and cruelty, and her charming simplicity places her beyond reproach. When it is announced that she will speak, great numbers flock to court. She rendered important service to her people at the period of the Belgian occupation.



A HATCHET OF NATIVE WORKMANSHIP

The symmetry of ornamentation on the carved ivory handle and the well-fitted, simply decorated, iron blade make this hatchet a model of Mangbetu art. Superstition decrees that such objects greatly influence the power of a chief, and after they have been given to him by the artist, the oracle is consulted to determine whether they will increase his prestige or be helpful in his enterprises. But the artist belongs to the same clique as the medicine men, and any number of joyful events are always accredited to such treasures until his reputation is firmly established



A Unique Record of Mangbetu Lineage.—This originally was an irregularly shaped block of diseased ivory, the base of a tusk the mate of which weighed one hundred and fifty pounds. It was held in high esteem as a relic by one of the king's relatives, and was a constant source of speculation as to its probable meaning until an artist's genius solved the riddle by showing that the protuberances coincided with the members of the owner's family and their descendants. He then carved the numerous faces which cover the reverse side as well as the one photographed



TRIBAL AND PERSONAL IDEALS EMBODIED IN IVORY CARVING

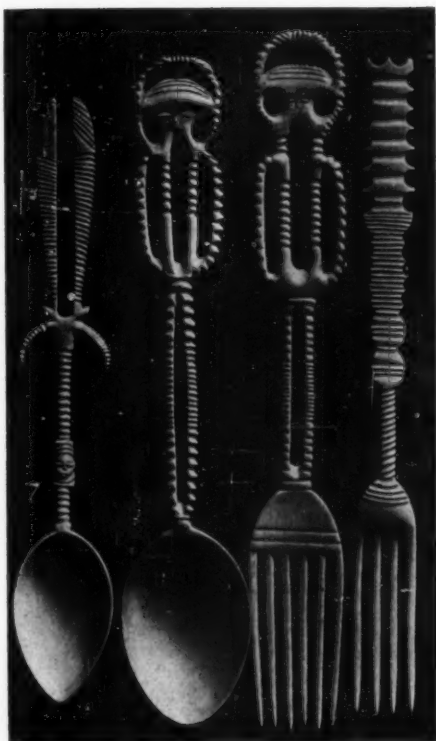
One would scarcely expect to find in ivory figures carved by Congo cannibals the embodiment of ideals. The figures, however, on the central piece, a mallet used to beat bark cloth, express, according to the artist, the supreme faith of these savages in mother love. The carvings on the box at the left express the unity of two friends. The female figure at the right is carved for the sake of beauty alone, as the Mangbetu have no idols; what appears to be a crown on the head is merely a conventionalized hairdress. The two small figures below and in front are three-headed boxes, showing the trend of Mangbetu ornamentation



RED CAMWOOD BOXES FROM MANGBETULAND

These three camwood boxes, with hollow sections of ivory, receptacles for such finery as iron and brass ornaments, beadwork, and talismans, are pieces that creditably reflect the artists' skill. Karibu, a Mangbetu, carved and put the boxes together, while Saza, an Avungura (of the Azande reigning class), engraved the hunting episodes on the ivory. The tops represent the large, conventionalized hairdress of a man and two women, while the foot of an elephant and bows of boats are seen at the base; encircling bands are symbolic of the roundness of a hut and therefore of family life.

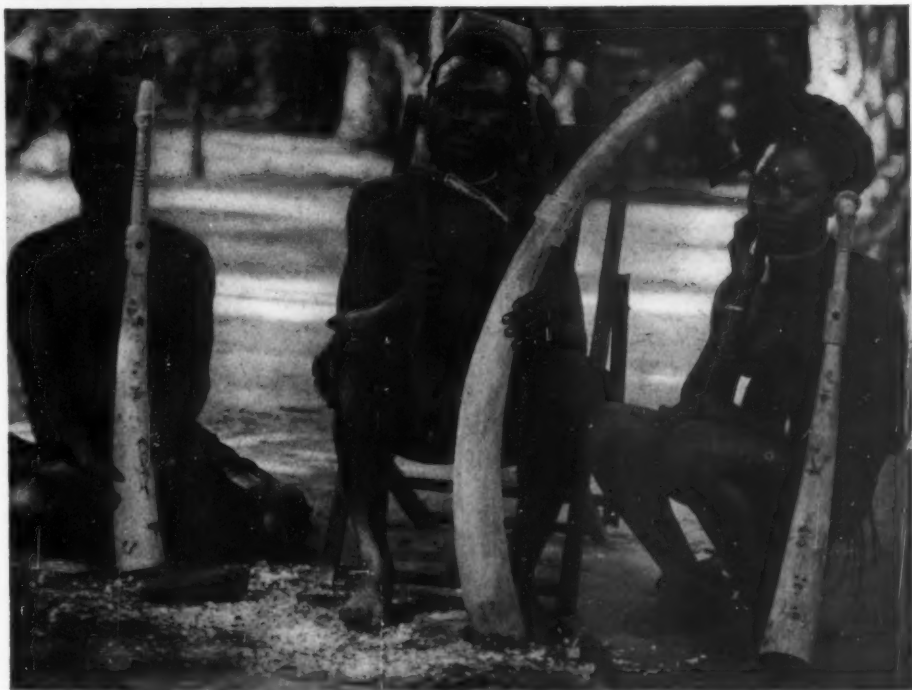
The pictographs on these boxes are figured and explained on pages 550 and 551



FORKS AND SPOONS OF NATIVE DESIGN

The natives' instinctive desire for artistic expression is evident not only in their houses, which are decorated with various geometric designs carried out in three colors, depicting scenes from native life, but also in the humblest objects; even knives and other articles bought from traders are afterward beautifully ornamented.

These carved ivory spoons and forks were presented to us by a Congo artist as more suitable than our simple camp implements. In his enthusiasm he remarked that even these elaborate models would be far too simple and small for the king should he eat in the presence of the ordinary natives as most Europeans do. Okondo's food, like that of any high chief, was served in a hut to which no one had access while he ate, although on rare occasions his councilors or relatives were invited, when they, like all other natives, used their fingers. Oil or peppery sauce was much relished and was dipped up in a piece of mush in which the thumb had pressed a hollow. This took the place of a spoon



Saza, a particularly skillful ivory carver, enjoys an easy chair introduced into the Congo by white men and widely imitated by the natives. A wife and a helper are of great assistance in his work. On the ground lie the numerous ivory chips cut with his adz. He was particularly fond of engraving sketches of scenes from native life. He also eagerly copied in outline pictures from European magazines of which he had a great store



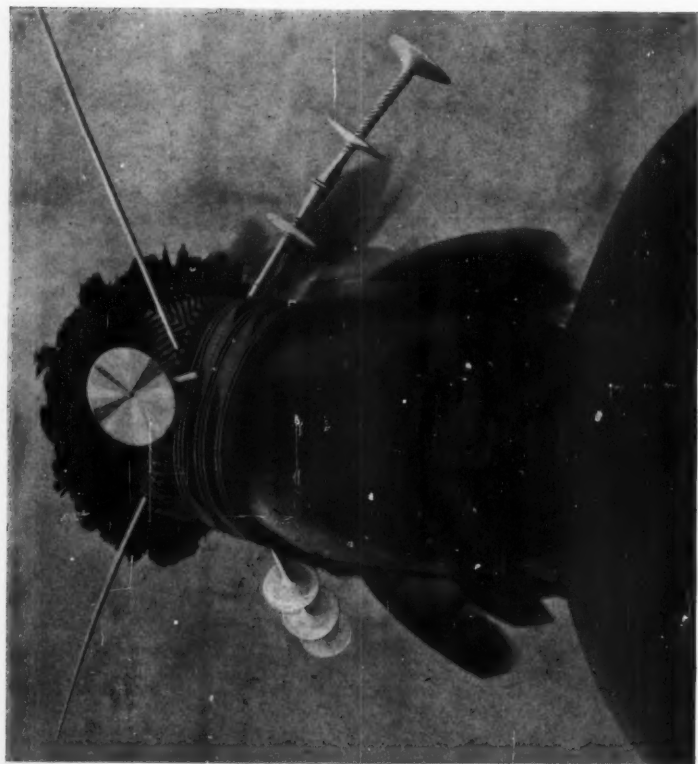
HE IS INSPIRED BY THE TRUE ARTIST'S LOVE FOR HIS WORK

The success of these ivory workers springs from their devotion to the work. It is a source of joy and inspiration to them. First—the ivory is roughened out with a native ax, second—the coarser carving is done with an adzlike instrument (the delicate carving which is done with long-handled knives is not shown here), and third—the surface is smoothed and polished with moistened leaves containing fine crystals of silica (for detailed explanation of process, see page 530)

FOR HOUSEHOLD USE AND FOR STRIFE

The great sickle-shaped show knives were carried hung loosely over the shoulder by the king and other prominent men when they were sitting in council, partly as proof of the wearer's readiness to strike; at other times, the knives were pushed under the belt. In a hand to hand encounter, using a knife like the largest shown, with sharp knobs on the edges of the blade, the skull of the enemy can be crushed by merely turning the knife. Experienced blacksmiths make three such large knives in about two days. So simple-minded are these cannibals that in former times it was considered a great honor by relatives of a captive if the king pierced the heart of the unfortunate man with such a curved knife, as he thus escaped the ignominy of being decapitated by the jailer

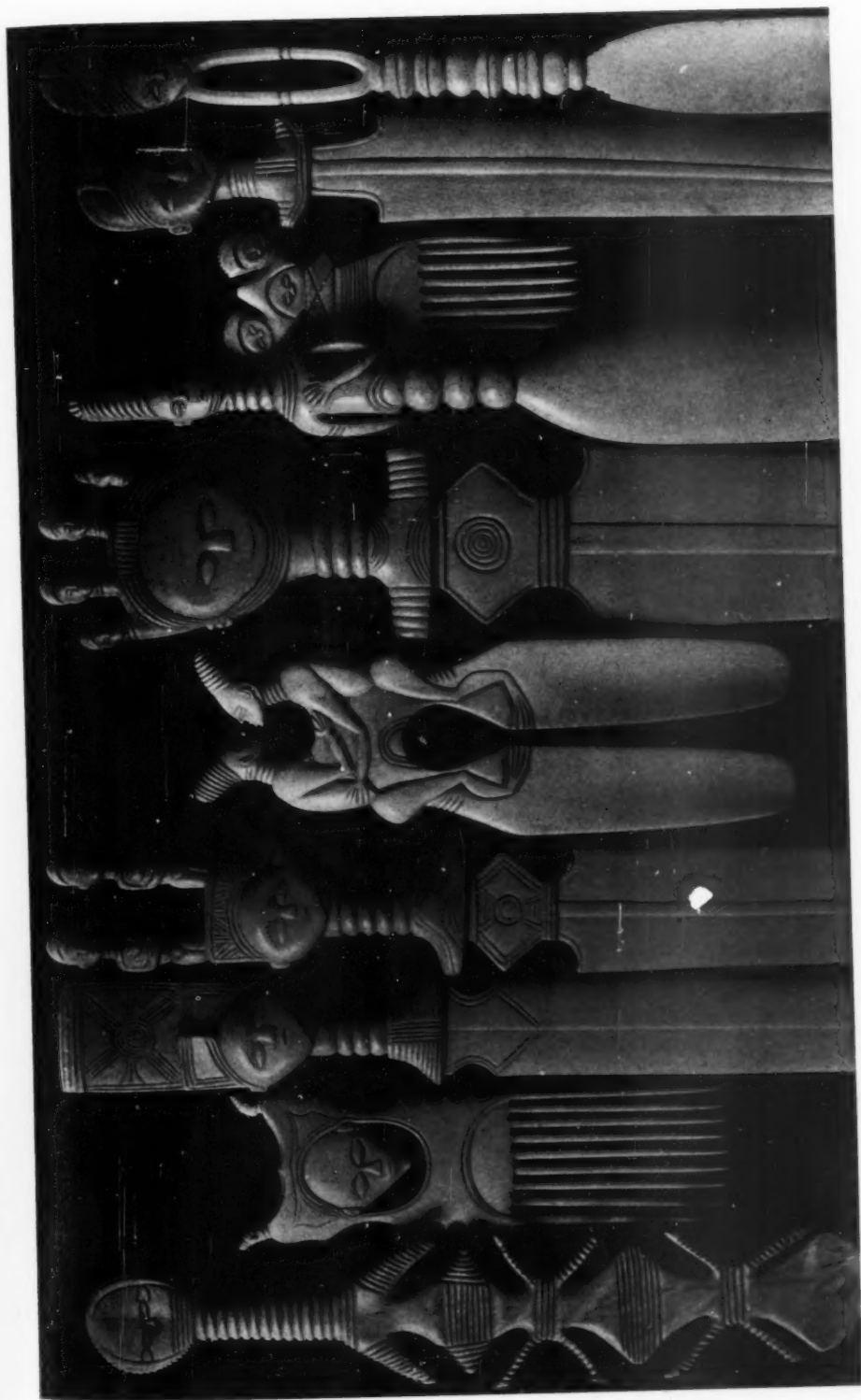




CARVED IVORY PINS FOR HAIRDRESS OR HATS ARE WORN BY BOTH MEN AND WOMEN IN MANGBETULAND

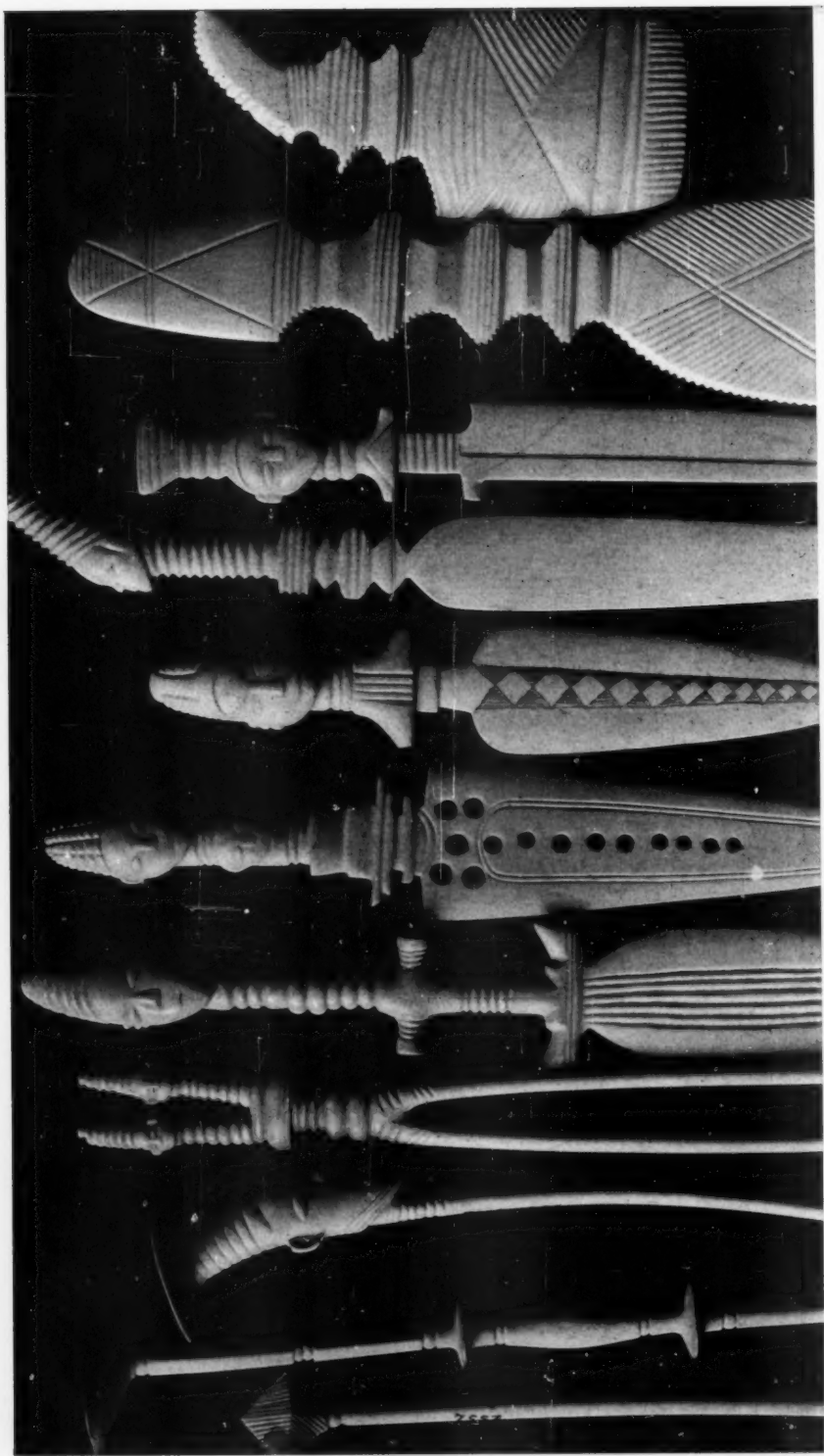
The incongruity of savage men wearing the most delicately carved ivory hatpins (something more than eighteen inches in length), recalls the beautiful orchids that grow on decayed trunks in the depths of the tropical forest. Only an experienced artist can hope to carve from the solid tip of an elephant tusk so slender a pin as these shown, topped with three large disks. No more wasteful design could be devised, for most of the ivory drops off in useless chips. All Mangbetu men of importance covet pins, most of which, however, terminate in a single concave disk, usually turned toward the front when worn, and supposed to represent the radiance of the sun.

Fondness for decoration finds an outlet in elaborate hairdresses. Bracelets, leglets, and necklaces are the other chief adornments. The string of blue beads worn by this chief's wife (at the left) supports shells from which the lead has been removed — ammunition used during the war with dervishes



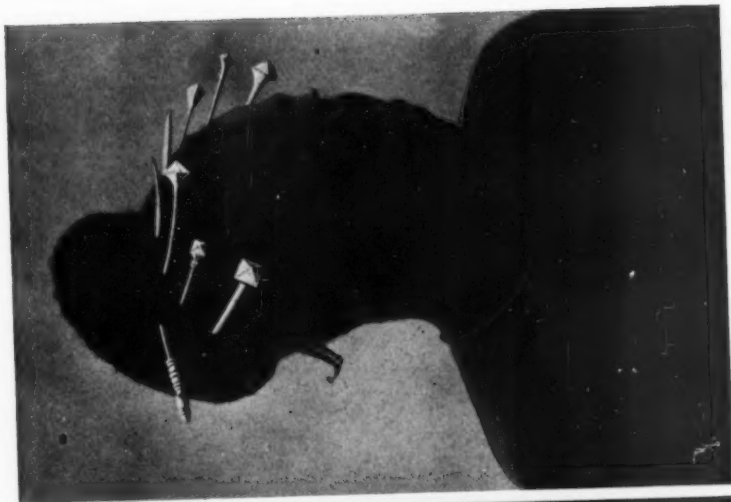
EXQUISITE EXAMPLES OF MANGBETU ART

The first, fifth, seventh, and tenth are ivory lades for stirring or serving mush prepared from bananas, millet, and sorghum flour. The second and eighth are combs to enhance further the often elaborate hairdress of the women. The third, fourth, sixth, and ninth are show knives, two of them with small figures on the conventionalized head, indicating the children of the owners



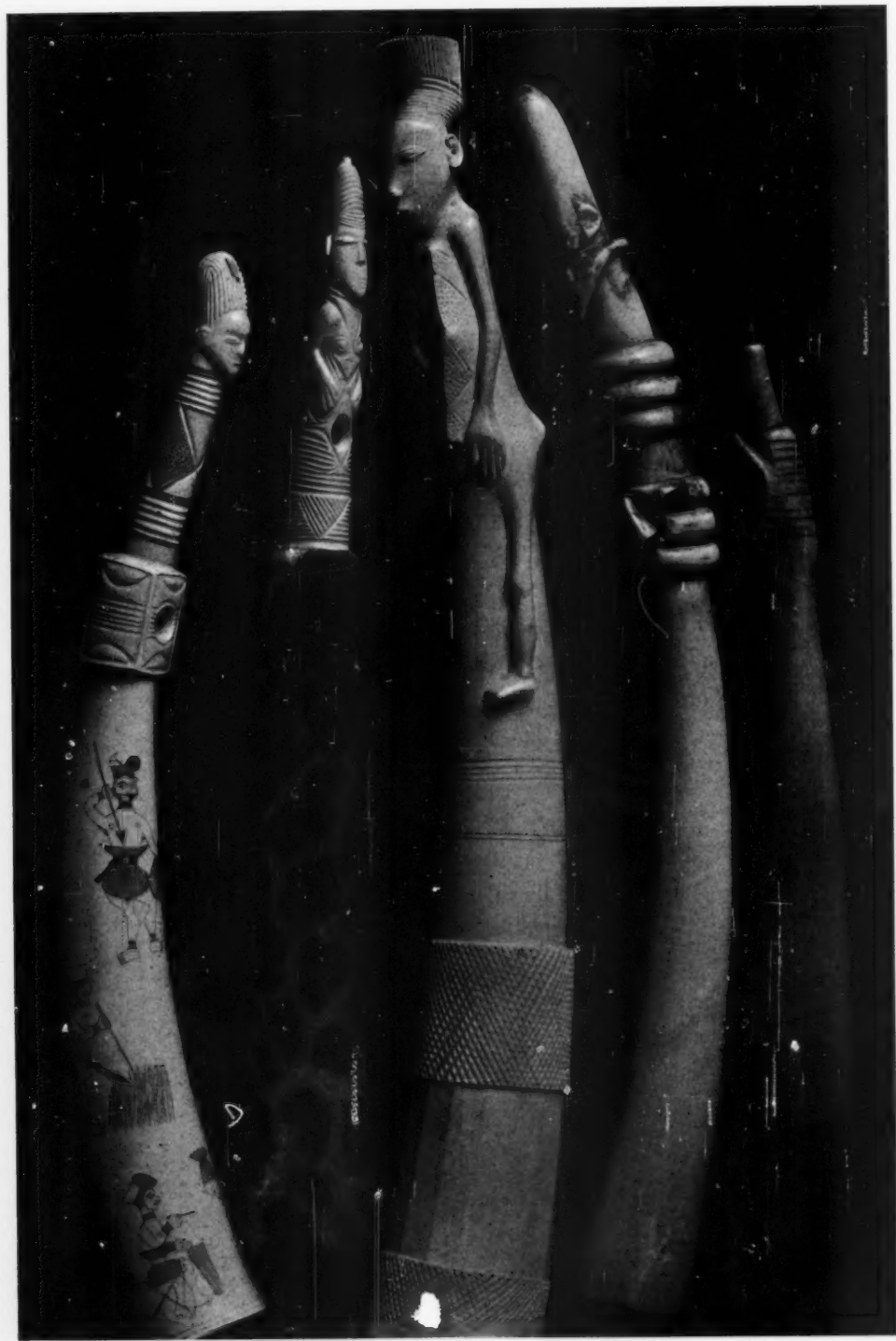
FURTHER EXAMPLES OF USEFUL IVORY CARVINGS

Four hat and hairpins (at the left) are followed by five show knives and by two line gauges used to trace designs on mud walls. From the intricacy and variety of pattern one would think that these Mangbetu artists must give considerable time to the study of their art, yet many follow the ordinary walks of life, turning to this work only as occasion arises, for a few years at most. At the first signs of old age, the Congo natives indulge in the privileges of patriarchal life



THREE MANGBETU WOMEN

At the left, the simple arrangement of the hair and a fiber necklace indicate distress or mourning; in the middle, a rear view of Queen Nenzima's elaborate coiffure may be seen; and at the right, ivory pins are arranged much as a coronet; face and body are decorated with designs in black paint, which wears off in a few days. The ease and luxury of the life at the Mangbetu court contrast strikingly with the dreary, burdensome life of the ordinary native woman. Small wonder that all girls in Mangbetuland crave admission to the king's harem. Eager competition ensues to obtain distinction by the arrangement of the hair and other decorative effects. Among their cherished possessions are ivory hairpins, which, far from contrasting unpleasantly with the jet black gloss of the hair, add much to their appearance. The Mangbetu women have the privilege of disposing of their treasures and some of the specimens now in the American Museum collection were graciously withdrawn from the hair and presented to us—for which we reciprocated, not with candy, but instead with a lump of salt, quite as "sweet" in their opinion.



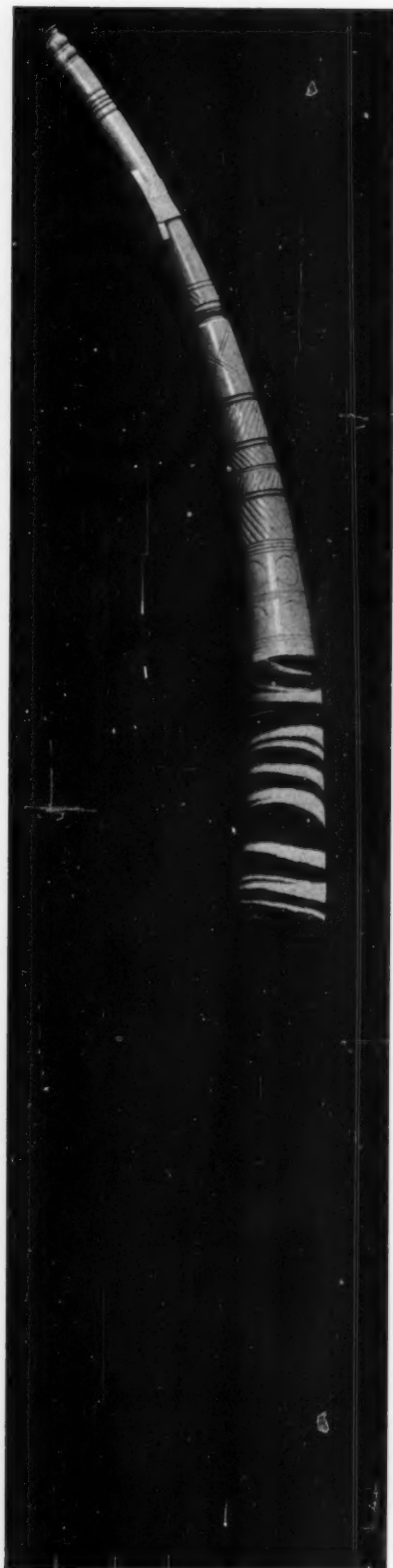
FROM THE CONGO COLLECTION OF IVORY HORNS IN THE AMERICAN MUSEUM

This series of carved ivory horns shows evolution from a simple hunting horn (below) to more pretentious examples. The horn in the middle has a peculiar charm, given by the beautiful lines, simple decoration, and mellow color of polished ivory. This example is closely rivaled by the smaller trumpet above, still more delicately finished and engraved with scenes from native life. The horn between has a clearer tone, however, than either of these; and is besides extremely light as it consists of a wooden tube covered with pieces of skin of the okapi and the leopard fitted into an elaborately carved ivory mouthpiece. The looking of horns may imply a summons to joyful events, but it is also often a means of signaling information great distances in time of peace or war



A TRUMPETER OF THE MANGBETU COURT AND HIS IVORY INSTRUMENT

Court trumpets are carved from a single tusk and are sounded only at the king's request, usually to announce pleasant events which serve to increase the ardor of the performers. The musicians are as proud and careful of their instruments as are modern artists



A war horn contributes to the fame of its owner. This type of horn usually consists of an upper part of carved ivory into which is fitted a wooden tube covered with striped okapi hide and the skin from the inside of an elephant's ear. Each war horn is especially consecrated and to the inside are fastened talismans for success



Numerous soft-toned musical instruments furnish evidence of the refinement of the Mangbetu. This specimen, Okondo's "harp," is covered with the skin of the mysterious okapi; it provided entertainment when the king was resting. It was always placed upon a mat so that "bad spirits" dwelling in the earth might not pollute it. The carved neck represents a conventionalized, well-tattooed human figure and the keys are richly ornamented, each terminating in a human head. The strings are of antelope skin



SMALL OIL DISHES CARVED FROM SINGLE BLOCKS OF IVORY

The Mangbetu take great care of the body, favoring the use of many oils, which they pour into small dishes or tiny calabashes for use. The owners are particularly proud of the distinctive form of their vessels, and often the more refined women, who are very vain, adopt some special scent for their oils. They also use powder made from various scented roots, beans, and other substances, and during festive occasions may anoint and powder the faces of their guests as a mark of special distinction.

Two of the oil dishes shown here, the mottled forms with an effect recalling the grain of bird's-eye maple, are made of diseased ivory and are highly prized. Notwithstanding that these are rather heavy pieces, one is pleased to note a feeling of delicacy and restraint in the work that any modern artist might envy.



This is a cannibal artist's first attempt to portray tragedies in animal life. These drawings and those which follow are mechanical reproductions of originals engraved by natives on the polished surface of ivory.



first.¹ They are used during festivals. Their loud, trumpeting sounds form a fit accompani-

ment to dances, and add to the admiration of the throng of visitors who spread afar the fame of the court.

The uncommon pride Mangbetu musicians display is attributable as much to their skill in performing as to the beauty of the instruments. No description can do full justice to the frantic endeavors of a trio refreshed with drafts of millet beer. To this day they have lost nothing of their verve, and Schweinfurth's picturesque description of forty years ago still admirably fits such a concert.

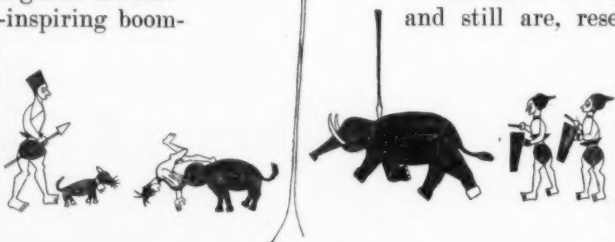
Rather ceremoniously they moisten the inner surface of the horn to heighten the resonance. Awe-inspiring booming typifies the ominous trumpeting of an elephant's fury; hardly less deafening, but with greater

denoting the calls of excited spearmen are cleverly interpolated. More melodious strains accompanying the joyous dances of the fortunate hunters and the happy crowd form the grand finale.

Centuries ago, long before he had learned to smelt iron, primitive man, invading the great West African forest, probably celebrated with hollow horns his success in hunting. Echoing through the shades of the towering trees, the blasts quickly brought together those fond of carousal and good cheer. Even today the boys of hunting parties claim the horns of the larger forest antelopes as their share of the spoils of the chase, and on a rocky ledge they grind off the solid tips and proudly flourish the deeply resonant notes of their own simple trumpets.

The tusks of elephants were, and still are, reserved for the

leaders in all strife. Although more difficult to work, horns of ivory produced louder sounds and, responding to the skill of the trumpeters, offered a con-



Pictograph from Congo ivory, showing how elephants come to grief for plundering native plantations.—The elephants, frightened by two men beating drums, are speared as they pass beneath the tree. An infuriated elephant charges one of the men, while the little dog (whose whereabouts is indicated by a clapper fastened to his collar) stands ready to track the scent of any elephant which escapes

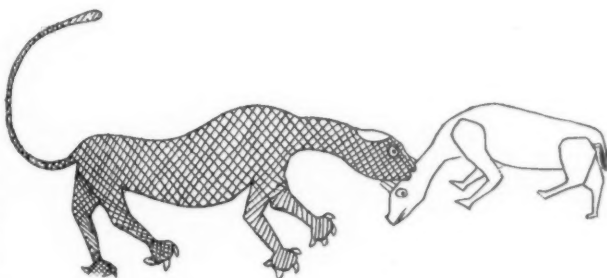
¹ AMERICAN MUSEUM JOURNAL, Vol. XV, No. 6 (Oct., 1915) and No. 8 (Dec., 1915).

siderable variety of pleasing notes. Their size, however, was limited by the weight of the tusks, and hence only the hol-lowest, those of young bulls, were available. After the natives had learned to work with iron tools, the great chiefs soon derived part of their prestige from the size of the horns, for the larger trumpets could be heard at a greater distance.

The well-known blasts represented the chief's full authority, for they transmitted the first summons to war and called the bravest to his side when he seemed lost in the fray.

To make a good trumpet is a difficult task, but gracefully curved tusks with a large cavity extending more than two thirds of the length considerably facilitate the work. These are common among elephants foraging in the districts where grows an abundance of succulent food, such as in the luxuriant rain forest; whereas tusks from elephants grazing on the rather arid, northeastern plains are more massive but with a smaller cavity as in the greatly reduced female tusks. Their texture is finer and the ivory harder, however, due to slower growth, as indicated by the concentric, probably seasonal layers.

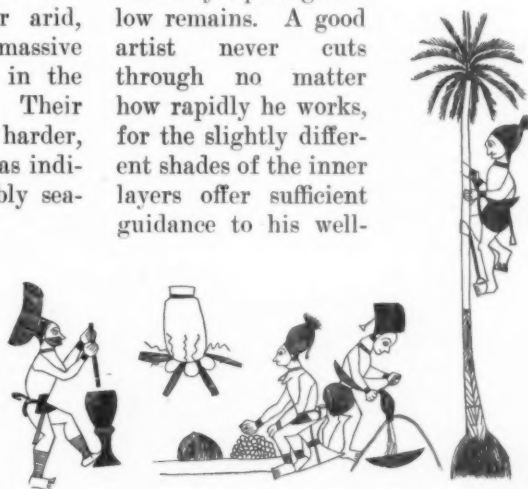
With a flexible rod the artist measures the extent of the cavity, near the narrow end of which, on the concave side, the mouthpiece is placed. Using only an adz and knife, he carves the hole for this mouthpiece, and in less than



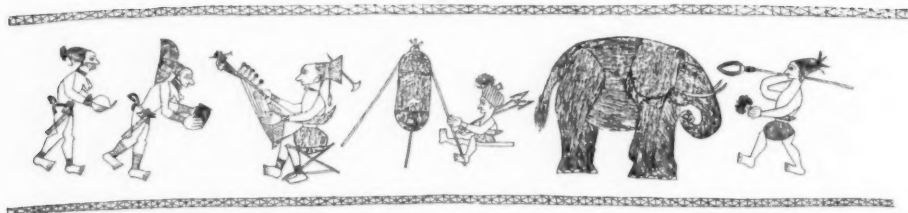
Further animal tragedies depicted in ivory by a cannibal artist.—A leopard springs upon a small antelope, crushing its skull; an African domestic hen worries a snake it has caught



an hour the first blasts announce his success. For ordinary horns, the massive top is cut off somewhat beyond the mouthpiece, forming a terminal finger-hole by which the pitch of the tones is controlled, as in a flute. But trumpets must be light, for they are brandished in every direction by the constantly pirouetting musicians. The solid ivory, from which artists of other lands fashion their treasures, flies off in useless chips until a mere shell around the naturally tapering hollow remains. A good artist never cuts through no matter how rapidly he works, for the slightly different shades of the inner layers offer sufficient guidance to his well-



Ivory pictograph of palm-oil manufacture.—The native at the right is ascending a oil palm to gather the nuts. He uses climbing ropes, standing on one while he moves the other higher. The nuts are boiled in the caldron (above at left). In a mortar (extreme left) the pulp is loosened from the kernels which are then separated out on a mat (middle). The oil press (at the left of the palm) is made of a flexible tree bent over, to which a troughlike, wickerwork basket with a loop at either end is fastened. The pulp is placed in the basket and by slowly turning a stick inserted in the loops, the palm oil is forced through the meshes into a wide dish on the ground



Ivory pictograph of elephant hunting.—The hunter makes music while his wives bring him wine and food (at the left). He sets up his shield and awaits the dictum of the oracle. Hearing that success will accompany his efforts, he proceeds to the hunt, holding in his left hand a yellow flower that is to render him invisible. He kills the elephant by severing its trunk

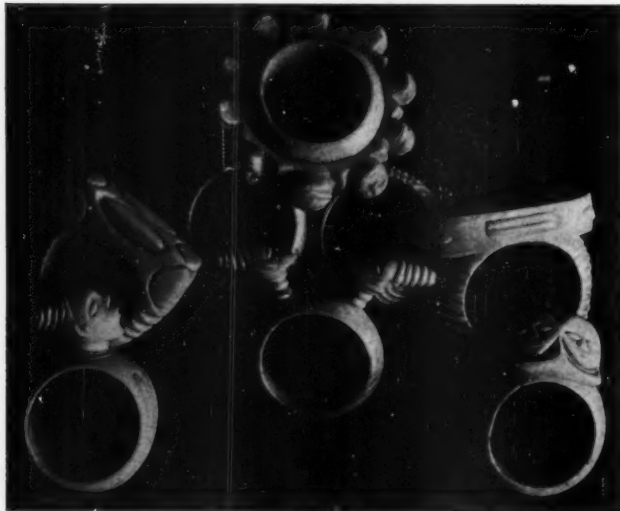
trained eye, and when in doubt he holds the ivory to the sunlight.

The king's trumpets are carved in heavy relief, with bands and parallel lines as the main embellishment. There may be other motives, such as canoes or human faces, but a conventionalized female figure or head is the most typical. This has evidently been adopted in honor of Queen Nenzima, the famous diplomat, who took part in all deliberations, and is perhaps responsible for the fact that the Mangbetu have adopted woman suffrage to a certain extent—a fact the more remarkable because women were kept in complete bondage by all the neighboring tribes.

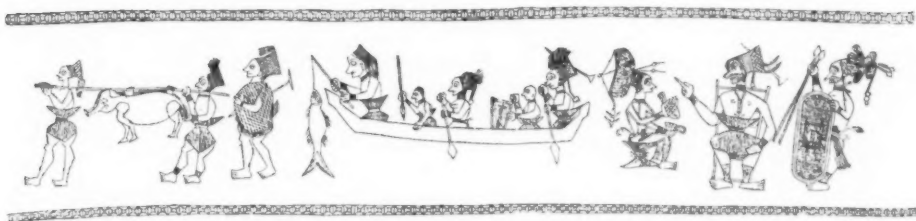
The finest example of a war horn

we have ever seen was prepared by the most skillful of Okondo's men, Karibu. As usual only the upper half is of ivory; the lower part consists of a carefully fitted wooden tube covered with portions of the hides of elephant and okapi. Mangbetu superstition has endowed these animals with extraordinary powers, that by the magic of the medicine men are concentrated in these fragments of skin and can be transferred to the owner of these charms. The elephant, the king of all beasts, is supreme in power, whereas the mysterious okapi is supposed to retaliate by wiping out his human aggressor, his family, and all who live in the same village. It is said that sounds of such war trumpets are liable to bring misfortune to renegades and enemies alike.

The subjects of Zebandra, another Mangbetu chief, boasted that their battle horn contained the medicine of doom for others. There were the finger bones, teeth, hair, and other dried portions of slain enemies bundled together in unusual harmony and fastened inside the hollow. The spirits of these victims were supposed to hear the notes of defiance, and the sounds, pass-



The Mangbetu natives make rings of carved ivory after the fashion of those they have seen worn by white men. These rings show the fancy of the natives for conventionalized heads and faces



Pictograph of hunting and fishing.—One party has been successful in the forest. The boar, suspended from a pole by loops cut and pulled up from its own hide, is borne by two men, while a third follows, carrying the hunting nets. The fishing party, too, has been fortunate, its success represented by the proverbially large fish. The second figure in the boat, a little boy, eagerly awaits an opportunity to spear a fish; the two other spearlike implements are oars. In the group of three at the right, the leader of the party (in the middle), on returning home, threatens his flirtatious wife with severe punishment for her conduct with a warrior (extreme right). To appease his anger, she offers him in one hand a bowl of wine, and in the other, leaves to wipe his perspiring brow.

ing across the fragments of the remains, were to carry such disaster to opponents as they themselves had experienced.

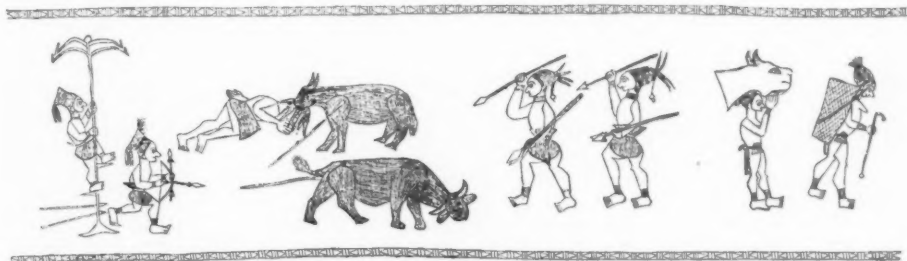
The great chiefs of the Spartan-like Azande, who conquered parts of Mangbetu territory, tried to imitate the wonders of the court of the Mangbetu king, for they recognized the importance of favorably impressing the natives enslaved by them. A few of the ivories in the American Museum collection show the work of Azande artists. Sasa especially decorated the horns with valuable records of customs and beliefs from the native's point of view. Without any previous sketch, these pictographs, often direct from actual scenes, are scratched on the well-polished ivory horns with the sharp point of a knife. From time to time the artist rubs his thumb over a piece of charcoal and passes it across the engraved line caus-

ing the picture to stand out clearly in black.

The only ancient ivory carvings found in Africa are those from Egypt, assigned by Petrie to about 7000 B.C. Although Assyrian and Phœnician ivories date to the ninth and seventh centuries B.C.,¹ subjects from about 4000 B.C. indicate that even then elephant tusks must have formed a valuable article of commercial intercourse.

The first piece of carved ivory we came across in the Congo was at Avakubi. Dr. Rosati, the resident physician and a great sportsman, showed us an interesting club, a smooth, nearly cylindrical piece of brown ivory about eighteen inches long. Natives, he told us, found it of service in breaking the bones of their victims—whose bodies were then soaked, to render them more

¹ *Ivory and the Elephant*, by Dr. George Frederick Kunz, pp. 8-13.



Pictograph of buffalo hunt.—When the wounded buffaloes charge, one native climbs a tree, another shoots poisoned arrows, while a third feigns death, illustrating the native belief that even an infuriated buffalo will not hurt a "dead" man. Hunters with spears come to the rescue, and the women at the extreme right carry home the spoils, a buffalo head and a basket of meat.

tender, in a part of the river inaccessible to crocodiles.

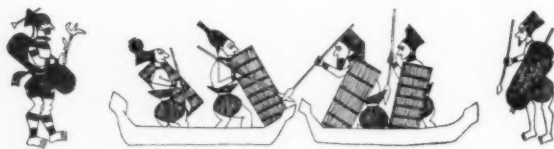
The largest tusks were always proudly carried home by the successful hunters and often exhibited in the villages as a matter of rivalry. Stanley, in recounting his famous trip down the Congo in 1877, mentions "a temple of tusks" seen at Basoko, and states that ivory was "as abundant as fuel." He records the finding of ivory horns, pestles, and mallets, and we know that much of the ivory first exported consisted of such roughly carved native implements.

Africa, so long the dark continent, for six thousand years has furnished raw ivory and, in the last few centuries, by far the greater amount of the world's supply.¹ Elephants formerly swarmed there; but, victims of the trader's greed, they disappeared as steadily from all sections as access was rendered more easy. The Ivory Coast (Guinea) and South Africa, once famous for the export of tusks, constitute the most striking examples of regions from which the elephant has virtually been exterminated in recent times.

¹ Asia's contribution of ivory has been comparatively small, for the tusks of Indian elephants, never as large as African, are often absent in the female; the supply of prehistoric ivory from mammoths has become available only recently although used for many years in China. The records of a single tusk of the African elephant are: in weight, 236 lbs. (British Museum), in length, 11 ft. 5 in. (New York Zoological Society, National Collection of Horns); whereas for the Indian elephant the record weight is 109 lbs., and the length, 8.9 feet.

No other substance used in art was procured at such exorbitant cost, and yet it served for the admiration of only the few. The gradual destruction of a kingly beast would have meant little in comparison with the desolation and distress loosed upon poor natives who happened to own tusks or lived where elephants were abundant. Ivory trade for a long period was identified with slave raids of Arabs, dervishes, and other irresponsibles.² The tusks were literally borne to the coast upon a stream of human blood, caravans of mistreated humanity. Those ransomed by relatives before they were impressed into such dreadful portage were lucky indeed; in general, a large tusk bought freedom for the unfortunate captive who otherwise would have become a slave. Now the ivory trade is everywhere under governmental control and follows established commercial principles. Though money was seldom used in the northeastern part of the Belgian Congo before its introduction in 1911, Greeks and Hindus bought ivory, principally in exchange for mules and donkeys. Chiefs, arrayed in old, gold-braided uniforms and looking for a steed, were eager customers. Cheap guns and powder also were acceptable, and contraband whiskey has always proved the most lucrative merchandise.

² Herbert Ward, *A Voice from the Congo*, Charles Scribner's Sons, New York, 1910.



Among the tribes far to the interior of Africa, such as the Mangbetu, wars are waged only on land, but if enemy boats accidentally meet in mid-river, as pictured here, the occupants make no attempt to throw spears. They try to capture one another instead. The dugouts are dragged to land, and warriors (shown at either end) decide the issue.

Th only canoes used are hollowed from a huge tree trunk, and it takes experienced natives from two to six weeks, according to the size of canoe desired, to chisel one out with ax and adz. A few tribes also char the inside to render the process of hollowing easier

Research in Science

THE PAST TEACHES THAT IT MUST NOT BE RESTRICTED TO UTILITARIAN PROBLEMS: THE WHOLE HORIZON MUST BE SWEEPED FOR FACTS: THE ULTIMATE PRACTICAL VALUE TO MAN OF ALL GENERAL AND ABSTRACT INVESTIGATIONS SURPASSES BY FAR ANY MONETARY COST

By WINTERTON C. CURTIS

Professor of Zoölogy, University of Missouri

THERE is an exhortation, supposedly epitomizing the wisdom of practical life, "Don't waste your time speculating on why black hens lay white eggs. Get the egg." This is, doubtless, good advice in business affairs and appeals to the average man as a sensible doctrine. But as we shall show, those who have done most for the world in a practical way have often been the men who speculated on just such problems as this—and who solved them. Today the man who gets the most eggs is he who in breeding and rearing his poultry follows the methods established by the scientific study of heredity, of selection, and of general physiology. And it is worth remembering that the scientific workers who established the more important of these facts were not lured to their work by the prospect of financial gain, but grappled with biological problems because of a conviction that knowledge of such matters was indispensable to human welfare.

If we analyze the "getting of eggs," as it goes on in the varied commerce of our modern world, we find that industry everywhere is rooted in the facts of science. Not uncommonly, whole fields of commercial enterprise go back to some simple but fundamental scientific generalization. Thus, the canning industry is founded upon what the biologist terms "biogenesis," or the fact that there is no life save from preëxisting life. For since putrefaction is an incident of the growth of microscopic

forms in organic materials, there can be no putrefaction where all living germs have been destroyed, by heat or other means, and where new germs cannot obtain access. The chemical processes which underlie so many industries have all been built upon the fundamental theory of chemical combination, which was elaborated during the latter half of the eighteenth and the first half of the nineteenth centuries, while in physical science, the generalizations regarding the indestructibility of matter and energy are similarly important.

We all recognize that only by painstaking effort can scientific knowledge be obtained. But we commonly fail to recognize the nature of the scientific studies which preceded the discovery of many facts applicable in our daily lives. Science is the foundation of life in civilized communities as well as of modern industry; and the scientific discoveries of the present will, if we do our share, be as vital in the lives of future generations. We should understand definitely that the distinction between "pure" and "applied" science is an artificial one, because no line of separation exists. On every hand, discoveries of a theoretical and general nature are of practical value; and, conversely, the practical achievements of science are a continual stimulus to further investigations along theoretical lines which, in turn, influence practice in wholly unexpected ways.

Any research that promises substantial additions to our knowledge is worth

doing in the present, because in the past such work has often yielded results undreamed of at its inception. The history of science urges us to the continuation of theoretical and nonutilitarian investigation, however much we may be tempted to press the more obviously utilitarian lines of study. Research along lines immediately useful will take care of itself, for we are all convinced that it pays big dividends. But where the immediate return is not in evidence, it requires a certain faith in the outcome which can be held only by those who know what has happened again and again in the history of science.

It is, therefore, important that teachers and preachers of science emphasize this phase of scientific progress. Scientific men have not made this item of their creed sufficiently clear to those who are not scientists. As they have opportunity, they should preach to the public as well as to one another the need for investigation unhampered by utilitarian demands. The oneness of science should be emphasized to the end that the public may understand how science advances, and that the public like the scientist, may live in the faith that knowledge of natural phenomena is always worth more than it costs.

There is not so much danger that we shall fail to appreciate research in applied science—how to grow thirty bushels of wheat where ten grew before—how to produce a new antitoxin. But there is danger that we fail to see the other side, that the men capable of doing creative work as investigators be unable to find a livelihood, and that in the present, as in the past, the advance of science may depend too largely upon the chance meeting of brains and means. To show that this danger is real, not imaginary, we may say that in zoölogical science there are in the United States today few positions in which a young man of promise may earn a living in pure science. He may teach, with small chance for investiga-

tion; he may find limited opportunities in the applied zoölogy of government or state service or of commercial enterprise; but for the man who gives promise of being competent to do the pioneering demanded by pure science, there is almost no opportunity for a living. A like condition obtains in many lines of science other than zoölogy. This failure to provide opportunity for the man of promise is a shame upon our civilization, for we are drying up the springs which feed the fountain.

Conspicuous ability as an investigator is rare, and every effort should be made to discover the man giving promise of such attainment. When found, he should have his chance, should be given clearance papers for a voyage into the unknown. Men who have this ability, who, standing upon the ground already mapped, can see the distant mountains, and whose imagination pictures the path across the intervening valley, are like the explorers of a virgin continent; they "yearn beyond the skyline where the strange roads go down." And our race has come out of barbarism because the desire for knowledge has impelled men of this adventurous spirit, in spite of discouragement and misunderstanding, persecution and death, to search after the facts of science in what is for man the last "dark continent"—the realm of nature.

"We were dreamers, dreaming greatly,
in the man-stifled town;
We yearned beyond the sky-line where
the strange roads go down.
Came the Whisper, came the Vision, came
the Power with the Need,
Till the Soul that is not man's soul was
lent us to lead."

This stanza from Kipling's "Song of the English" is chosen as a text in an analogy between the "nature searcher" and the explorer. Incidentally, it shows that science has not destroyed the opportunity for imagination. For, although "the old order changeth," there

remains in our thinking that which brings the emotional appeal of epic verse; for here, indeed, men do contend with gods and strive to wrest from them the knowledge which shall make our future more secure.

The history of almost any line of scientific investigation, if traced back, will afford illustration of the matter in hand. The following three cases which I have chosen are representative and have often been used in my teaching:

1—Microscopic organisms, which have been a subject of careful investigation for several centuries.

2—The development of the freshwater mussel (a case where I can lay claim to some first-hand knowledge).

3—The study of heredity, a field of investigation which is still in its infancy.

Knowledge of the Microorganisms of Human Disease Began in Theoretical Non-utilitarian Research

Our present knowledge regarding the microscopic organisms which are the cause of disease is recognized today as of life and death importance for the whole civilized world. But this knowledge had its beginning in investigations which were of questionable value when judged by the utilitarian standards of the past. Society might well profit by this bit of history and assume a far-sighted policy in dealing with scientific investigation in the present.

That many diseases are caused by minute organisms, living as parasites within the bodies of animals and plants and so producing the derangements called disease, is a fact made familiar to the public during recent years; and we are making such progress in the discovery of germs hitherto unknown, of antitoxins, of vaccines, and the like, that even the antivivisectionists may some day be converted. Today, diphtheria is no longer the dangerous and often fatal disease it was even twenty years ago; and if we take the precautions already

well tested, there is no danger that yellow fever will again scourge our Gulf cities, or bubonic plague devastate Europe and America as it still devastates the Orient. We have conquered typhoid fever, at least in cases of local epidemics or where large bodies of men are sent into dangerous territory, and no man can foresee where our control of disease will end.

Have you ever considered how we have attained to this mastery over disease? Do you know what is the history of this knowledge we now have, and whence came this body of facts which now grips us even unto matters of life and death? I do not refer to the most recent chapters, as heralded in the newspapers or current magazines, when an antitoxin for diphtheria or a method of preventing typhoid fever has been announced. These are but the recent pages of a book long in the making, to find the title-page of which we must turn back through many years and to matters having little apparent connection with what is now before us.

To test the truth of this last statement, let us trace the course of man's discoveries regarding the microorganisms, taking as a convenient starting point the year 1676 when the Hollander, Antony van Leeuwenhoek, discovered with the microscope, which had but lately come into use as a toy and source of amusement, what he described as "little animals observed in Rain, Well, Sea, and Snow Water as also in Water wherein Pepper had lain infused."¹ Leeuwenhoek's discoveries were, I suppose, regarded as useless by all his contemporaries save a few, by whom the work was highly esteemed. Some small means enabled him to devote a generous part of his time to study; and at the end of a long life he had examined with his microscope pretty much everything he could lay hands upon in both ani-

¹ See Kent, W. Saville, *Manual of the Infusoria*, for quotations from, and an account of, the work of Leeuwenhoek.



Courtesy of Henry Holt and Company

LEEUVENHOEK, THE FIRST GREAT MICROSCOPIST

To know the history of our present control of disease through the destruction of its microbes, we have to go back to Holland and the middle of the seventeenth century, when Antony van Leeuwenhoek was making what the world thought useless discoveries of bacteria and protozoans. The microscope, then just invented in a simple form, was little more than a toy, but it so fascinated Leeuwenhoek that it is said he gave a great part of his life to study with it and examined almost everything he could lay his hands on. It is recorded that he had more than two hundred instruments with an incredible number of lenses which he ground himself. It was his discovery of the flow of blood in the capillaries connecting the arteries and veins that was the final proof of Harvey's theory of the circulation. This man's work is only one instance of the ultimate practical value of theoretical research: most of the biological discoveries of greatest value in industrial and medical science have been made in the course of studies in pure science. Can we not make it possible that more of the young men of America have a chance to do scientific research? The Leeuwenhoeks of the future are among them



MENDEL, THE WORLD'S MOST FAMOUS STUDENT OF HEREDITY

Gregor Mendel (1822-1884), abbot of a monastery at Brünn, Austria, through experiments made in his garden, chiefly with peas, demonstrated a law of inheritance which was one of the great biological discoveries of the nineteenth century. This law is based upon his discovery that, in cross breeding, the parental characters are not blended but retain their individuality to such an extent that in subsequent generations they may be separated and recombined like the cards in a pack. Mendel's interests were along theoretical lines and not in any way utilitarian, yet so important was his discovery that today Mendelism is becoming a household word. The most successful breeder of animals of the future will be biologically trained and will know every twist and turn of the latest Mendelian formulae (See page 562)

mate and inanimate nature. Among other things he discovered some of the larger bacteria, many protozoans, the passage of blood from arteries to veins through the capillaries (the one link needed to complete Harvey's evidence for the circulation), and he was the first to describe the human spermatozoön. He thus became the first great microscopist.

"We were dreamers, dreaming greatly,
in the man-stifled town;
We yearned beyond the sky-line where
the strange roads go down."

Despite crude and imperfect microscopes, knowledge of these animalcules grew apace, and during the eighteenth century the more important types were recognized. Their discovery reopened the discussion of spontaneous generation, which, a few years before Leeuwenhoek's first observations, had been discredited in the case of insects and larger organisms, and a bitter conflict was long waged between the opposing forces. During this struggle facts were established which not only aided in the final triumph of our conception of biogenesis, but also resulted in extensions of knowledge useful in other directions.

With the advent of the cell theory in 1839 and with marked improvements of the microscope, the distinction between multicellular and unicellular organisms was established, while the age-long controversy was closed by Pasteur in his studies upon disease and fermentation, Tyndall in his examination of the floating matter of the air, Dallinger and Drysdale, who first observed the complete life cycle of a protozoan, and a host of others. And here, these "nature searchers," who since the days of Leeuwenhoek had been pressing their forces into the seemingly useless fields which teemed with microscopic life, joined with the men long baffled in their fight for human lives, and gave to medicine the support needed in reach-

ing the vantage ground from which to discover a new horizon line in the "germ theory of disease."

For a long time, physicians had known that certain diseases were "catching." "The pestilence that walketh in darkness," was no idle figure of speech. An analogy between the spread of disease and the spread of living organisms had been pointed out for centuries. But only in the nineteenth century, in the generations of our fathers and grandfathers, did the medical men, aided by the investigators who had ventured into the wider domain of abstract science, show that the germ is so truly the cause of infectious disease that without the microscopic germ the disease does not exist.¹ Since the firm establishment of this germ theory, now the "germ fact" of disease, investigations in this direction have received increasing support, until in recent years we have seen the establishment of institutions for general medical investigation, like the Rockefeller Institute in New York City or the Cancer Laboratory in Buffalo. And so immediate have been the results, we may well believe that laboratories of this character are destined in the near future to be generously supported by state and private beneficence.

The point for us is that these recent triumphs in an applied science had their beginnings in the days of Leeuwenhoek, and that this attainment has been possible because of the work of investigators who did not consider the immediate utilitarian values of what they sought, because of the labors of men who persevered in the belief that all facts of nature are worth while and who died in the faith that somehow, sometime, the facts they had established would find a place in man's scheme of the universe.

¹ First-hand contact with the medical discussion of this period may be obtained in Oliver Wendell Holmes's essay upon puerperal fever, written in 1843. This is well done and has the advantage of being found in almost every library.

"Then the wood failed—then the food failed—
then the last water dried—
In the faith of little children
we lay down and died."

Did our time allow, and could we go through this history in more detail, we should see how the more important of the earlier workers were students in pure science attempting to make what were termed in the earlier days "contributions to knowledge"; we should realize how the long fight over the question of spontaneous generation was for centuries only an abstract and academic matter of no seeming value in everyday affairs; we should learn how the burden of this pioneer work was borne by men who were given scant public assistance and little recognition at the time—who followed no path of least resistance.

"On the sand-drift—on the veldt-side—
in the fern-scrub we lay,
That our sons might follow after
by the bones on the way."

The lesson for us is plain. Are we in this day of enlightenment doing much better by the workers in pure science? We hail extravagantly the successful investigator in applied science, like Edison, and he is well rewarded; although what he gets is insignificant compared with that allowed by society to its swashbuckling captains of industry. But we do not provide for the man of promise in abstract science a chance to keep at his work, in the hope that he may make real contributions to knowledge. We are greedy over the finished product, while we turn out, to starve or teach, the young men among whom the Leeuwenhoeks of some future science must be found.

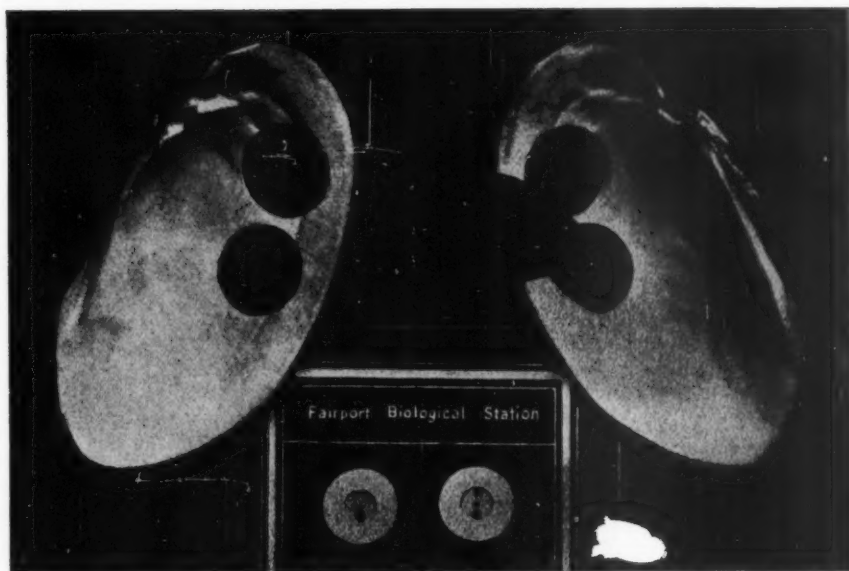
The criticism is that our civilization, although made possible by the control of nature which science has brought, is not offering adequate opportunity for further investigations. We are neglecting that which might lead to things as undreamed of as was the germ theory of disease, when Antony van Leeuwen-

hoek discovered certain "little animals observed in Rain, Well, Sea, and Snow Water as also in Water wherein Pepper had lain infused."

*Knowledge of the Life History of the
Fresh-water Mussel, Which Allows
Control of the Pearl and Button
Industries, Was Gained in
Theoretical Research*

The details of the life cycle of the fresh-water mussel were discovered after years of study by those adventurers of science who struck into the "hinterland" of nature, where lay no beaten trails; and the facts established in this earlier period and with no utilitarian aim have during the past twenty years been turned to account in commercial enterprise.

Briefly, the life cycle of the mussel is as follows: The sexes are separate, the spermatozoa are discharged freely into the water. These enter the body of the female with the respiratory water currents and there fertilize the eggs contained in brood-pouches which are formed by a modification of the gills. Development now begins and continues until a larval stage, known as the "glochidium," is reached. In this stage the young are discharged into the water. The glochidium, which in size is near the limit of visibility for the unaided human eye, now rests upon the bottom of the stream and must perish before many days unless accidentally brought into contact with a fish. In the latter event, the glochidium fastens itself upon a fin or gill, whereupon a growth of the fish's epithelium takes place and, in the course of a few hours, the glochidium is completely enclosed within the tissues of its host. Thus securely placed, it undergoes development to a stage in which it is able to assume the life of the parent mussel. It then drops from the fish to the bed of the stream and takes up an existence which is continued throughout life. Two points are of importance in this cycle.



Courtesy of the United States Bureau of Fisheries

Shells of mussels artificially reared and two of the four buttons which have been cut from the shells. —The manufacture of pearl buttons from mussel shells began in 1891 and the rapid increase in the business soon threatened the destruction of the mussels. The United States Government in consequence entered upon a series of investigations as to the practicability of propagating mussels artificially. This is a commercial problem, yet success depends upon a knowledge of the life history of the mussel, which has been gained by various investigators in theoretical work. The life history is unusual: after the young mussel develops from the egg to a larval form called "glochidium," barely visible to the naked human eye, it is discharged into the water where it develops further or dies, depending on whether it has an opportunity to attach itself to some fish. If chance favors it, it takes up the life of a parasite until far enough developed to leave the fish, drop to the bottom of the stream, and enter upon the life of the adult mussel. The task, therefore, of artificially breeding mussels, involves the bringing together of suitable fish and the young, almost microscopic, glochidia. Investigations have shown that a moderate sized fish may successfully carry from one thousand to two thousand of these parasitic guests



Courtesy of the United States Bureau of Fisheries

Part of a group of ponds for experimental work at the United States Fisheries Station, Fairport, Iowa.—This is an experiment station for the propagation of mussels as well as for fish culture. It was established by act of Congress in 1908. The mussels in the illustration above were reared in the pond in the right foreground. Work is carried on at the station to determine what species of fish are best suited to act as hosts to the parasitic young of certain species of mussels, and to ascertain the length of the period of parasitism and the life history of the young mussels thereafter, as well as the possibility of rearing them in ponds or in floating crates

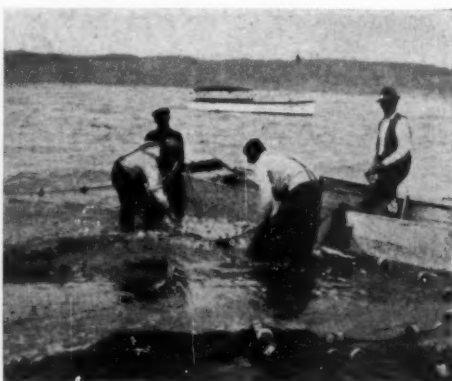
The glochidium is a stage at which development ceases and death ensues unless the larva becomes attached as a parasite upon a fish. The gaining of this favorable environment within the fish's tissues is wholly accidental; and so many glochidia perish that they must be produced in enormous numbers in order that the chances of destruction be overcome and the continuance of the species assured.

When we examine the paths followed in the establishment of the facts above outlined, it happens that the trail again begins with Leeuwenhoek. Before his day it was not even known whether there existed in these lowly organisms anything comparable with the "maleness" and "femaleness" recognized in higher forms. Their whole mode of generation, whether spontaneous or by means of eggs, was a matter of dispute. In his efforts to solve these fundamental, but at the time wholly academic questions, Leeuwenhoek turned his microscope upon the fresh-water mussels and discovered the innumerable eggs and larvæ which crowd the brood-pouches. These he correctly interpreted as the young of the mussel in which they were found;

and it is clear from his descriptions that he saw enough of their development to justify his opinion that mussels, like the more familiar forms of animal life, arose from eggs. In the subsequent advance of our knowledge two periods are conspicuous, one marked by a mistaken hypothesis, the other by the discovery of the parasitism. The first period, which extends from 1797 to about 1830, was ushered in when the failure to secure stages beyond the glochidium led to the so-called "Glochidium Theory," which maintained that the larvæ were not the young of the mussel in which they were found but a wholly different species living within the mussel as a parasite. This theory had the one advantage of all incorrect hypotheses; it aroused opposition which in turn called forth investigations. These showed once for all that the glochidium was the young of the mussel in whose brood-pouch it was found.¹

Disproof of the glochidium theory left the facts regarding the subsequent

¹ In passing, it is of interest that the word "glochidium," by which we still designate these larvæ, had its origin at the period when the supposed parasites were described as a species which parasitized the mussel and were named *Glochidium parasiticum*.



Courtesy of the United States Bureau of Fisheries

Seining fish in Lake Pepin, Minnesota, for mussel propagation, and transferring the fish to the infection tank.—The supply of fish for this purpose is obtained chiefly by seining in the public waters. Overflow ponds near the course of rivers which under natural conditions dry up leaving the fish to die, are seined out, and those species suitable for infection with mussels are used in that work. Afterward, these, together with the other fish taken, are liberated in the river, thus reclaiming large numbers of fish which otherwise would be lost—as well as propagating the mussels

stages by which the larvæ reach the condition of miniature adults, an unmapped territory where all trails went blind, and only in 1866, when a young German investigator¹ made the somewhat accidental observation of glochidia living as parasites upon fishes, was the clew discovered and the work of following the later stages made possible. During this final period, the post-glochidial development became well known and the earliest stages of egg and embryo were reexamined in the interests of fundamental research upon development throughout the animal kingdom. Most important of all for illustration of the point here made, is the fact that, from Leeuwenhoek's beginning, all this work was part of an attempt to understand the nature of individual development in the animal world. Through it all, the direct pressure of utilitarian consideration is nowhere to be found, but rather a belief by the investigators that the facts were worth knowing because they gave a broader horizon to the landscape of nature.

In 1891 the first pearl button was cut from a fresh-water mussel shell. The business soon became a substantial industry and, within ten years, the destruction of the mussel beds in the Mississippi seemed imminent. At the request of the manufacturers, the United States Bureau of Fisheries undertook a brief survey and offered some wholesome advice, all of which was disregarded with the opening of new sources of supply in Arkansas, Indiana, and along the Ohio. Seven years later, under the stress of a still diminishing supply, the manufacturers again approached the United States Bureau of Fisheries with the result that the Bureau made an extensive study of the mussel with a view to its artificial propagation. The results of this in-

vestigation have now been brought together² and, since there are still many fundamental questions involved, the government has constructed, at Fairport, Iowa, a station for the investigation of these and all other problems of fresh-water biology, and as a part of this station, a hatchery for the rearing of mussels by artificial means.

While much remains to be done before the rearing of button mussels is established upon a commercial basis, the results are encouraging, and we may hope that before many years the supply of raw material will be drawn from beds artificially produced and maintained. As this work in applied science advances, it is conceivable that the men who have dealt with these practical problems may win popular recognition greater than that given to any of their predecessors during the two hundred and fifty years since Leeuwenhoek. Be this as it may, I do not hesitate in saying that to the earlier workers belongs the larger measure of recognition, that theirs was the more unique attainment; since between the two there is the difference between the man who broadens a beaten trail and him who penetrates territory wholly new.

The Future Structure of Society and Character of the Human Race Are Likely to be Controlled by Knowledge of the Workings of Heredity; This Knowledge Was Gained by Investigations not Aimed to be Utilitarian

In the field of heredity we have known so little, have so failed in the discovery of landmarks until very recent years, that biological science is only beginning to get its bearings and hew its way into the wild. We stand

¹ Leydig, F., *Mittheilung über den Parasitismus junger Unioniden an Fischen in Noll.* Tübingen, Inaug-Dis. Frankfurt a. M.

² Lefevre, G., and Curtis, W. C., *Studies on the Reproduction and Artificial Propagation of Fresh-water Mussels, Bulletin of the Bureau of Fisheries*, Vol. XXX, 1910. See also the miscellaneous papers by other investigators, in United States Bureau of Fisheries *Bulletins* since 1910.

as those who have just effected a landing upon a new continent, whose supply camps are established, whose axmen are out, and who are beginning the march. This is a field of investigation where discoveries are so new that men have not yet grasped the importance of them and set the facts to work in ways to suit the need. This is a problem of the future, and as such, appeals the more strongly to our imagination. How is it that we have come thus far upon our journey?

The fact of hereditary resemblance must have been recognized since man first gave attention to the breeding of domesticated animals, or first saw that his own offspring was like himself. But heredity remained rather the plaything of the philosopher than the problem of the scientist, until the manner of individual generation had become established and the germ cells recognized as its physical basis. All the earlier work upon reproduction and development, all the investigations which centered around the discussion of spontaneous generation, all the studies which led to the cell theory were necessary to establish our present position, and to give the investigation of heredity its point of departure. With these things behind it, heredity has become a subject of prime interest in present-day biology, and only in the last quarter century has our attack begun. Two men stand out as pioneers of the recent advance—Mendel, whose work was the earlier done but the later known; and Galton, who should be credited with collecting valuable data and with arousing public interest by his eugenic propaganda, although his supposed "law" appears of small importance when compared with the law enunciated by Mendel.

Without attempting an explanation of either the Galtonian or the Mendelian theory of heredity, a word may be said in illustration of an essential difference between the two. We are all familiar with the tables published by

insurance companies, which tell us the expectation of life for a man at a given age. I am, say, thirty years of age. The table says I may expect to live until I am sixty-four. This is well so far as it goes. It is comforting to feel I have that much lease on life, even though life is half spent. And this knowledge does very well for life insurance companies, since it can be applied to thousands of policyholders with a degree of certainty which places the whole superstructure of the insurance business upon a stable foundation. In my particular case, however, this kind of certainty is not satisfying, since it can tell me nothing of my own or any other individual's duration of life. Though I die tomorrow or live to be a hundred, my life merely counts as one item in the statistics upon which such tables are based. These insurance tables allow us to make prophecies for populations, not for individuals, and this is essentially the nature of Galton's law of heredity. It attempts to say what will be the inheritance on the average, but leaves us in the dark as to what will happen in the individual case. If, on the other hand, after looking me over, the life insurance company were able to say that, barring death by accident, I would become an octogenarian, or to say that inability to resist disease would cut me off at forty, then we should have the kind of prophecy it is possible to make in cases of Mendelian inheritance. For here we can, by proper testing of the individual, foretell the characters he will transmit to his descendants. Galton's law is then of value as a statistical statement, but Mendel's is a guide to a fundamental analysis of heredity.

The discovery of the Mendelian phenomena was not the result of any feverish search for utilitarian values. Mendel's interests were along theoretical lines, and the account of his experiments remained buried in an obscure publication until after the same phe-

nomena had been rediscovered by later workers about 1900. And now, with not two decades of the twentieth century gone over our heads, Mendelism is becoming a household word. So many facts have already been accumulated and so revolutionary are some of the conceptions, we begin to doubt whether our other theories of heredity have had any value whatsoever. And we look forward with hope, because we at last seem to be upon firm ground and to have found a way of advance.

So great is the importance to mankind of accurate knowledge, and hence control, of heredity that the results which must inevitably flow from the obscure beginning made by Mendel, the Abbot of Brnn, are not easily appreciated. Already the breeding of domestic animals is feeling the impetus, and the superstitions which have clouded the efforts of practical breeders are becoming things of the past. The breeder of animals in the future, who would have large success, must be biologically trained, and must know every twist and turn of the latest Mendelian formulæ; for the same laws hold good in the insects as in man, in the horns of sheep as in the colors of poultry. Breeding will shortly become an exact science, demanding extensive biological training and a thorough knowledge of the shorthand which the Mendelian worker has invented for the visualizing of his complex phenomena.

For the human race, we may some day breed better men—although, of course, the time is far distant when any selective mating will be possible, save as we develop a social tradition that makes us feel disgraced if we marry where the stock is clearly defective, and save as we enforce a rigorous prohibition of the right which conspicuously defective individuals now have to inflict their full quota of descendants upon society. These things will come slowly, for the social organization is discouragingly stable, and we cannot

be oversanguine when we contemplate the attainment of perfection at some future period. As Huxley put it, "if the temperature of space presented no obstacle, I should be glad to entertain this idea of ultimate human perfection; but judging from the past progress of our species, I am afraid that the globe will have cooled down so far, before the advent of this natural millennium, that we shall be, at best, perfected Esquimaux."

For all practical purposes, however, it is enough that man may improve his condition in the course of a century or so, a thing we obviously do accomplish in some degree. And we may expect material advance in the near future, if we do no more than prohibit what is clearly bad, while giving social approbation to the kind of matings which make for better men. But shall we stop here, once we recognize the facts? We have given up—among individuals, if not among nations—the cherished right to knock the other fellow on the head if he disagrees with us; and the type of mind which desires progress rather than precedent believes that the future will see the surrender or restriction of other rights now regarded as fundamental. It may even come to this matter of marriage and giving in marriage. Already we are making the attempt to prevent hereditarily defective individuals from reproducing their kind, a thing which can be safely attempted only when the facts of heredity are fully known for the particular cases in hand; while the eugenic propagandists are leading the thoughtful and conscientious members of society to consider their obligations in the light of heredity.

When we really get beyond the present "sky line," we shall do more than this. For the future will demand better brain and more of it than the past, and a sound body to go with the better brain. It has been said that "the rulers of the world have been big eaters";

which is probably true to the extent that those who hold their fellow men effectively in hand are, commonly, men and women of some brute force. One might say, as the converse of this, that the thinkers of the world have been below the average in physical attainment. For, while it cannot be stated accurately, it seems clear that nature exacts heavy penalties for much intellectual effort and that for most of the race physical toil, even though arduous, is still the most wholesome of all activities. How to realize the old Greek ideal of the beautiful body and the beautiful mind is still afar off.

Our present results indicate that heredity, and not environment or education, leads to permanent progress. If this is so, the application of the facts of heredity to our species will be one of the great problems of the future, and we see now that we are on the right track and that adequate knowledge, and hence control, of heredity may be possible sooner than we had thought.

What we have seen in the history of man's study of the microorganisms, in a more restricted case like the freshwater mussel, and in the broad field of heredity, will be found in other lines. Facts apparently remote from present needs come to be the very life blood of a subsequent generation. There are, doubtless, barren fields, but almost any fact of nature is worth studying, since only by continued searching do we find that for which we seek. In our quest for facts, we must so advance that no spot is left wholly unexplored; for we cannot tell what importance any part of the field may assume. We cannot

afford to concern ourselves today merely with what seems useful, since the more important advances of the past have so commonly been made through fields which at first gave small promise of value.

To some extent, the needs of practical life have induced men to explore the unknown territory of nature. But to a greater extent investigators have been led into this territory by their attempts to learn more of nature irrespective of utilitarian values. We should, therefore, spare no effort to make such investigations possible. The recent history of science indicates that a larger amount of research is now in progress, "where the strange roads go down," than at any time in the past, and that the more important part of this work is being pursued without the incentive of immediate gain. Workers in science should, in the face of the very general failure of the public to appreciate this situation, consider the ways and means to a better understanding. The case should be presented to the people and to students in scientific courses in a way to make all understand that science is not "just a lot of this bug business," as I heard one man say of zoölogy, but "a man's job" which appeals to the imagination and which taxes to the limit the intellectual resources—a task we must take up where our forebears laid it down.

"Follow after—we are waiting
by the trails that we lost,
For the sound of many footsteps,
for the tread of a host.
Follow after—follow after—
for the harvest is sown:
By the bones about the wayside
ye shall come to your own!"

"How Shall I Learn to Teach the Blinded Soldiers?"

By WALTER G. HOLMES

President and Manager of *The Matilda Ziegler Magazine for the Blind*¹

NOT a week passes that several persons do not come to me and ask what they must do to learn to teach the blinded soldiers.

When I ask what experience they have had with the blind, I usually get the reply that they have had none, and often they tell me that they have never known or talked with a blind person. I then advise them to look up someone who is blind, among the 75,000 already blind here in this country, and who needs help. Then they ask, "What can I do for him?"

On one occasion I advised a lady to find some blind persons who lived circumscribed lives and take them out to "see" the world; take them for a walk; take them to a theater; read aloud to them; take them to a museum; or, best of all, take them to the park or the woods. She asked, "Why, what good would that do them, they can't see?" And such a woman thinks she can teach the blind soldier—can lift him up and make him feel that there is yet a place for him in the world, to be useful and happy!

The word "see" has two meanings—to see with the physical eye and to see or comprehend with the spiritual eye—and possibly it is through the spiritual eye after all that the most of our pleasures come.

If one wants a practical demonstration of this let him take a healthy normal blind person into the woods; there show him the trees and their various sizes, explain the bark of this and that

tree, and its leaves. Let him touch with his fingers the growing grass or soft mosses; let him touch and smell the blossoms of the growing plants. His sense of smell being quickened, perhaps he may get a deeper fragrance from the flower than you do. His sense of hearing has been more cultivated than yours and he will detect a sweeter note in the bird's song than you do, and will hear more in the singing of the tiny insects that fill the grass and the trees than ever comes to your ears. You would give such a person a day of infinite joy, and food for happy thought and reflection for days to come, and you would go home realizing that the blind can "see" if we will only help them to do so.

You will find your blind friends asking you the color of each article or flower. Of course, if they have ever seen they will recall just what this or that color is, but if they have never seen they will also get a satisfaction, for they have a mental picture of each color—incorrect no doubt—but who knows that their mental picture of it may not be more beautiful than any glowing color our eyes have ever seen?

I once asked my brother, blind from infancy, to tell me his ideas of color, for he always asked the color of each new article he "saw." He told me that he got great satisfaction from knowing the color of things, but I found the realization of each color came to him as a sound. He said he knew that "red" was a dazzling color and that

¹ *The Matilda Ziegler Magazine for the Blind*, of which Mr. Holmes is president and manager, is a monthly publication financed for the last ten years by Mrs. William Ziegler of New York City, at an annual expense of about \$25,000. Ten blind girls, two of whom are deaf as well as blind, are employed in collating the sheets of the magazine. The magazine is sent free each month to every blind person in the United States and Canada who can read.



A blind girl is operating the Braille typewriter which uses a system for the blind invented by a French teacher, Louis Braille, in which the characters are represented by raised dots. The "touch method" in typing here reaches the point of perfection



A deaf and blind girl reads proofs of *The Matilda Ziegler Magazine* and records errors on the typewriter. Useful employment removes the greatest burden, idleness, from the shoulders of the blind

when one told him a thing was red it came to him as a shrill whistle; he knew that the foliage was green and a restful color, and when told a thing was green it came to him as soft music. My brother's sense of hearing is so acute that he can tell when we are passing telephone poles or lamp-posts at the edge of the sidewalk from six to ten feet away. If we are driving along a country road, he can tell by the sound when we are passing a tree and when we are in open country or in woods. This comes from the law of compensation—he has to depend on sound and he has cultivated this sense. I have heard it said that the blind can tell color by touch, but I have never seen one who could, and I do not believe that there is anyone who can do this. I do know a blind lady, though, whose sense of touch is so acute that she can tell the denominations of paper money. She really feels the ink in which the numbers on the bills are printed.

The blind, as a rule, have a keen sense of humor, which is surprising to the average person who supposes that they think gloomy thoughts only. One blind person once said to me, in complaining that most of the literature printed for them dealt with religious matters: "They seem to think that we blind can have no pleasure in this world and must always be thinking of and preparing for the next."

I remember, on one occasion, my brother and I called to see a very pious old relative in a distant state, who had never met him. She wanted in some way to express her sympathy for him and she said: "Oh, James, you should be so thankful that you

are blind, as there are so many wicked things in this world that you cannot see." At once he replied, "Well, Cousin Sarah, there are a lot of them I'd like to chance one eye on."

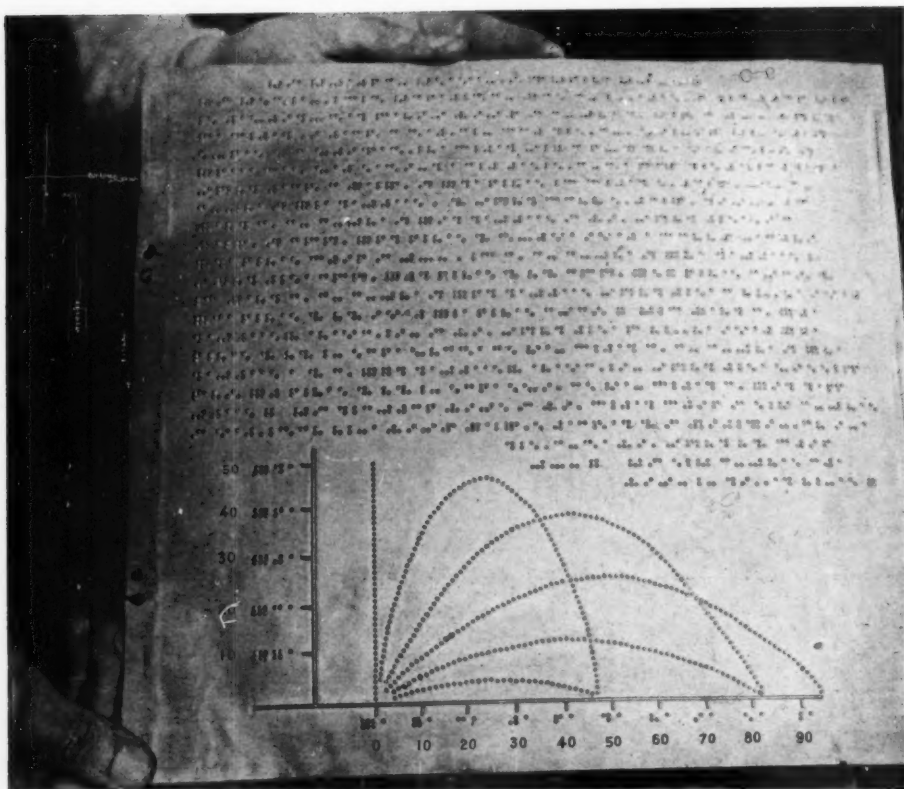
The blind do not want sympathy—they want to be treated just as other people are treated, and they do not want to be reminded constantly of their blindness, of which they already know enough by experience. A blind girl once said to me, "I wish my friends who knew me before I lost my sight would help me to forget that I am not normal, because I am, except that I do not have my sight. They are always sympathizing with me and sympathy makes me weak."

It is interesting to note that sooner or later there comes to all blinded peo-

ple a sense to detect obstacles in front of them. I have wondered if this faculty came from sound, a sort of echo, or if it came from a pressure of the atmosphere which they felt on nearing an object. Psychologists have attributed it to the latter, but I believe it comes from the former, for I have heard blind persons "clucking" or making a slight whistling sound when walking in unfamiliar places. They told me they were "sounding" to see if anything was in front of them. I am confirmed in this belief by the fact that a girl in my office, who is both deaf and blind, does not have this sense of detecting objects in front of her. This girl, however, has the sense of touch developed to an unusually high degree. I can write in ordinary script with the



Blind girls collate the sheets of *The Matilda Ziegler Magazine*.—The one week of each month which finds them thus engaged they call their "week of happiness," as they are then profitably employed. Much of the world's work could be done by the blind, and the present shortage of labor is calling attention to the fact



The range and angles of the "Big Bertha," the gun which has been shelling Paris of late, are set forth on a page of *The Matilda Ziegler Magazine*. The scale of miles shows the heights and horizontal distances reached by the shells. The blind take as lively interest in the events of this world as most other people, and naturally do not appreciate the apparent attitude of many of their friends that they should only be preparing for the next

point of my finger in the palm of her hand, and she can comprehend it as rapidly as I can write it, or she can hold her hand on mine as I write with a pencil and read what I write. This girl gets a pleasurable sensation from placing her hand on the piano as it is played. She knows in this way a dozen pieces, and will repeat the words of the songs, going slowly or rapidly as you play them.

The American Museum of Natural History of New York is doing much in its special work for the blind,—the program of which is changed monthly, where they can feel the objects exhibited,—and also in its course of lectures for the blind. It has arranged with the boy scouts that they act as guides for

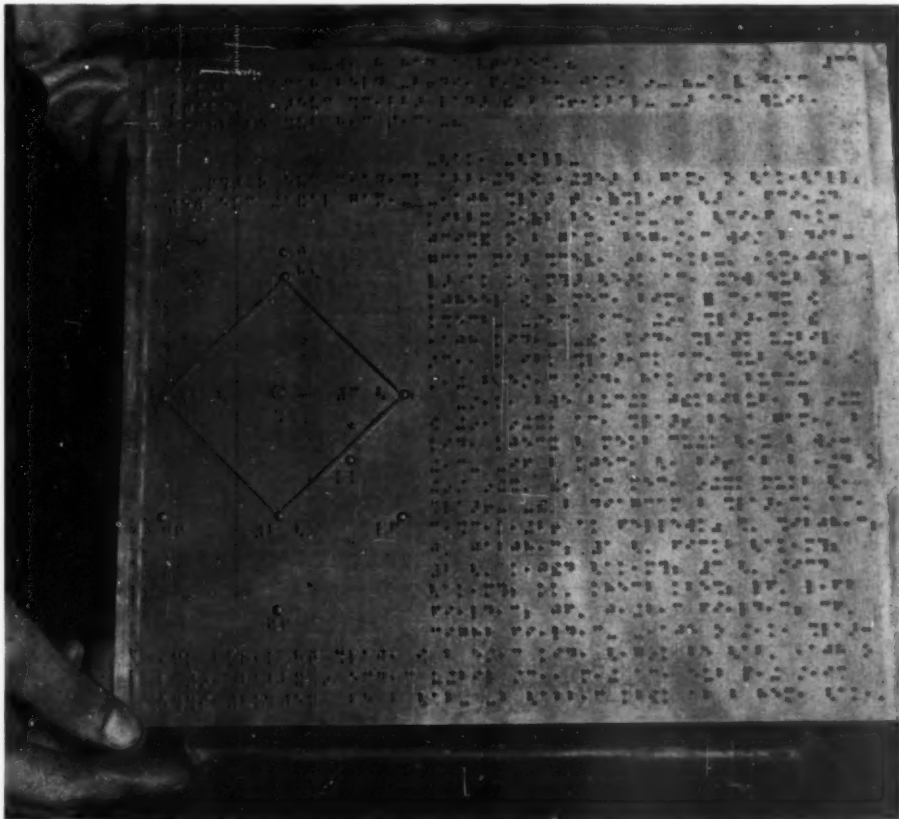
the blind who have no one to bring them, and it is one of the finest sights to watch one of these husky boys carefully leading a stooped old blind woman or man into the lecture hall; and it may be that he has gone away over to Brooklyn to get her. I wonder, too, if the public knows that the American Museum furnishes the car fares for those blind who are unable to pay. It is done gently, with no suggestion of charity that so hurts the blind, but the almoner sits at the door and asks, "Cannot I give you car fare for you and your guide?"

A few weeks ago I took our deaf-blind girl (Katherine McGirr) to the American Museum, and as the editor of this JOURNAL and I walked with her,

I placed her hand on one of the tusks of the big elephant, and then on its trunk, and at once she exclaimed, "Oh, a big elephant!" She told me she had never "seen" an elephant before, but knew it only from the descriptions she had read. She was greatly interested in a human skeleton—its smooth skull—its loose teeth—its ribs and its long fingers and toes. The big meteorite gave her great pleasure and she asked its weight, which necessitated my getting the information for her that it weighed 37,107 lbs. This girl rarely ever forgets the hand of a person she has met once or twice. She tells the hands by the lines along the back and at the knuckles, but if the hands have just been washed and

softened with soap she has difficulty in recognizing them.

I had the pleasure of spending an evening recently in the home of Miss Helen Keller. I was accompanied by a young blind woman who sings beautifully, and of whom Miss Keller is very fond. As she sang, sitting at the piano, Miss Keller stood behind her, and by lightly resting the first finger of her left hand gently on the singer's lips and the little finger on her throat she got not only the words but the melody of the songs, her lips sometimes moving as she herself also repeated the words. Occasionally in the ecstasy of delight Miss Keller would move her right hand up and down, slowly or rapidly with



The Matilda Ziegler Magazine gives its readers a description of baseball. This game is greatly enjoyed by many blind persons, when with friends who describe the hits, home runs, and so on, as they occur. Blind persons have, as a rule, a keen sense of humor and are not at all of the gloomy turn of mind usually attributed to them.



TWO DEAF AND BLIND GIRLS EMPLOYED ON THE MATILDA ZIEGLER MAGAZINE

One is reading the magazine to the other, telling her by the manual alphabet what she reads. To those not accustomed to dealing with the blind their facility in communicating with each other by this means is marvelous.

Many are asking today what they can do to help the soldiers blinded in the war. There are many ways, but first let us realize that we have 75,000 blind in the United States already who need help and whom we can assist in a multitude of ways to become normal and happy

the music, and at times would throw back her head as she drank in the song. It was a beautiful picture I shall never forget. One of the songs was of roses, "the red for joy and the white for pain." When it was finished Miss Keller said, "Oh, I think the tone of your voice is so splendid on that word 'white.'" Another song was "Pitter, Patter, Little Drops of Rain," and she tapped her fingers on the singer's shoulder in accompaniment with the drops of rain on the windowpane. Later we walked in her flower garden and she knew every flower as I plucked it and showed it to her, naming at a moment's touch the pansy, the larkspur, the rose, and other flowers.

What do the blind get out of a study of nature?¹ They get all and perhaps more than we do, but the shame is that thousands of blind sit *idly* in their homes—some of these too poor to be called homes. Meanwhile there are thousands of persons ready to teach the blinded soldiers and get the glamour that would come from that, and yet seldom give a thought to these others who could get so much pleasure from a friendly chat, a walk, or anything to take them out of their narrow lives and give them a chance to "see" and taste and smell and hear and feel the beauties of nature that abound just outside and beyond their narrow walls. It was Miss Keller who said, "The burden of the blind is not their blindness but their idleness." The fault that they are idle is not theirs—it is ours. We who have been blessed with sight are blameworthy. We can give the greatest pleasure to these blinded ones by helping to make them normal, happy people, and we can, too, find employment

for them and lift this burden of idleness that is greater than their blindness. At any rate we can give them hours and days of pleasure, and I will guarantee that each of us will get for himself even greater pleasure in doing it.²

There are 75,000 blind in the United States. It is not likely that there will be 750 blinded soldiers, possibly not one fourth of this number. There is plenty to be done, you see, for all our blind at home in addition to the needs of the war blinded; and, besides, the Government and the Red Cross stand ready to do for every one of them.³ Let us, at least, become better equipped to help the soldiers, by learning more of the neglected already blind, and of their needs.

² Just now when there is a scarcity of labor everywhere, if we look about, with a visit to some neighboring factory, we may be able to find where the blind can fill many of these needed places. A manufacturer called on me a few weeks ago and during our conversation said, "I wonder if there is any work in my place a blind person could do!" I said, "Let me go with you and see." I saw at once that there was, and the next morning two blind girls were at work there getting, and earning, \$1.25 a day. Another girl has been added since. Not one of these girls ever earned \$3.00 a week before with her knitting and similar work. The work is the manufacture of spark plugs, and the girls assemble, wrap, and box these plugs.

³ A "Red Cross Institute for the Blind" has been established on the grounds of the Military Training School for Blinded Soldiers, at Cold Spring Road, Guilford, Baltimore, at the request of the Surgeon General of the United States Army. The Institute, located on a beautiful country estate, is planned to supervise the activities of blinded marines, sailors, and soldiers, after they enter civil life and to supplement the training given at the Military Training School for the Blind.

The "Committee of Direction of the Institute," as appointed by the Red Cross War Council, is made up as follows: Mr. Henry B. Wallace, chairman; Lieut. Col. C. H. Connor, vice chairman; Alfred E. Shipley, M.D.; Mr. James P. Munroe; Mr. M. C. Migel; and Lieut. Col. James Bordley, director of the Institute. The hope is that the war-blinded men can be placed in positions which will utilize as far as possible the training, experience, and interest of their work before the war. The Institute will cooperate with the educators and other workers for the blind, including libraries, the *Ziegler Magazine*, and other printing plants for the blind, in the production and distribution of study and reading matter.—THE EDITOR.

¹ If one wants to read a fascinating story, let him get the book of the blind naturalist and writer, Clarence Hawks, *Hitting the Dark Trail*, published by Henry Holt & Co.

Note on the American Museum's Work with the Blind

THROUGH the Jonathan Thorne Memorial Fund, established in 1910, the American Museum has been enabled to develop greatly the educational work for the blind of New York City which was begun in an experimental way during the previous year. This work has been conducted along the line of public lectures for adults and of classes in the Museum for children. In addition, the schools are provided with Museum specimens of mammals, minerals, birds, and ethnological objects for use in their class work, together with small plaster cast models of these, and also with large relief globes of the world. Blind children in New York City have such limited opportunities for coming in contact with natural objects that the use of such material as the Museum affords is in itself a revelation to them, stimulating the imagination and widening the mental horizon. School work is thus made more interesting for both pupil and teacher. The number of totally or partly blind children in the grades in Manhattan, the Bronx, and in the Washington Street School, Newark, New Jersey, is in the neighborhood of ninety. These children, in classes of from nine to ten, are brought to the American Museum by their teachers, who select the day and hour most convenient for themselves. Here the individual needs of each child are met by special instruction, since there is of necessity considerable variation in age, intelligence, and degree of blindness. Pupils are allowed to handle the objects used to illustrate the lesson and are encouraged to ask questions. Talks are

given by Museum instructors upon topics selected by the teachers from a list submitted to them at the beginning of the year. The list of topics for the spring of 1918 included the following: "The Earth and Neighbor Worlds," "A Journey to Africa," "Animals of the Seashore," "Animals which Fly," "Trees, Buds, and Twigs," "Baskets and Pottery of the Indians," and "The Story of the Stone Age." Also a number of talks given last year on similar subjects were repeated by request. The Museum appreciates the value set upon the instruction, as evidenced in the regular attendance of the classes and by numerous letters received from the teachers of the blind children.

Besides the blind children, the number of sightless adults with whom the Museum endeavors constantly to keep in touch is about seven hundred. Invitations are sent to all these for the free lectures prepared by the Museum especially for them. Wherever necessary carfare to and from the Museum is advanced and boy scouts kindly volunteer

to act as guides. The attendance at these lectures is usually about three hundred. The animals, birds, or flowers which form the subject of the evening talk are placed on exhibition in the foyer of the Museum where they may be handled by the audience. (See note at the bottom of the opposite page.) Among speakers at these evening talks to the blind have been Messrs. Ernest Harold Baynes, Louis Agassiz Fuertes, Ernest Thompson Seton, Charles Crawford Gorst, G. Clyde Fisher, and Admiral Robert E. Peary.—
ANN E. THOMAS.



One "good turn" of the boy scouts of New York City is to act as escorts to the lectures for the blind at the American Museum of Natural History



GETTING AN IDEA OF THE WORLD WITH THEIR FINGERS

By means of these globes, which are loaned to those public schools of New York City and Brooklyn which teach the blind, the children get their first conception of what the world is like. They realize that it is round, that it inclines on its axis, and they learn to locate its principal cities and chief physical features. They feel the heights of the mountains and the flatness of the deserts and run their fingers along the courses of rivers. When they have discovered the character of a country they are told the history of the people who occupy it, and they are allowed to handle specimens illustrating clothing and implements and native animals. Blind children who have taken a number of lessons can point to any place mentioned. They may make a journey by sea from New York southward and across the Panama Canal, or a trip by train across the continent and thence to Japan, stopping at the Hawaiian Islands on the way.

The American Museum has fifteen such relief globes, twenty-six inches in diameter. They were designed in consultation with the late Gertrude E. Bingham, supervisor of classes for the blind in New York City, and were executed by Howells' Microcosm, Washington, D. C. Great care was used in preparing them. A trial globe was made and corrected after experimental work with the children.

NOTE.—The flashlight photograph reproduced on the back of the cover of this number of the JOURNAL shows a group of blind and partly sighted persons examining mounted specimens of wild birds in the foyer of the American Museum. It is not difficult to tell from the expressions on the various faces which of the group are wholly blind and which have been surprised by the flashlight. Opportunity is afforded both before a lecture and afterward to see the objects lectured about. On the occasion of a wild-flower lecture the foyer is gay with masses of the fresh field and tree blossoms; before a bird lecture there are tables covered with the mounted birds and with bird nests. In all cases instructors are at hand to answer questions. The interest of the blind in nature is very genuine. They are especially glad when they "see" a bird or flower they have heard about but have never touched before, or when they see one perhaps known in years gone by when they were not blind. After having made the acquaintance of the birds in this way they take special pleasure in listening to the whistled bird songs.



IMAGINATION AND THE SEEING HAND

The suffering is deep that comes from a sense of unworthiness for life, of limitation which unfits one to give service to those he loves, and to take his place with others as a normal, useful member of home and society. This suffering is thrust upon children of sensitive nature who are blind. They need help in such study and play as will give them a broad vision outside themselves and a courage of spirit to fight their way into helpfulness to others and even full self-support when they are grown. Blindness does not mar the power to learn or to attain to great knowledge or wisdom; it merely requires a different channel through which sensations shall enter the brain. It does not hinder the association of ideas or formation of theories as in any child who can see. It does not hinder the action of the imagination. In fact the blind build up a very real and vivid world—and as we all know, the most beautiful world is that of the imagination. There might even be the question whether, other things being equal, one sees better with the hand or the eye. Surely it is true that the touch of the hand is very real and near, leaving nothing uncertain. This blind child can put together her reading and her various touch impressions and visualize the traveler in Arctic snows quite as well as can the child who has gained her ideas of snow and snowshoes through her eyes



HAND AND FINGER MEMORY

He knows his household pets—especially his dog. Now, from his opportunity at the Museum, his mental vision is reaching out to include the wilderness animals. A blind child's hand becomes acutely sensitive to line and surface. It soon learns to recognize innumerable fine distinctions and slight modifications which carry to his mind a quick identification of objects. He reaches out his hand from his darkness and it is as if the light shone; he reaches it out from his isolation and he is not alone. Helen Keller, speaking of the value of the sense of touch for the blind, says in connection with her dog: "He loved it [her hand] with his tail, with his paw, with his tongue. If he could speak, I believe he would say with me that Paradise is attained by touch; for in touch is all love and intelligence." There is good evidence for the assertion that in the education of children who see we attach too little importance to the value of the sense of touch



BLIND CHILDREN LIKE "TIP," THE ASIAN ELEPHANT

Fortunately for the children of the blind classes, many specimens exhibited in the American Museum are not under glass. The children cannot quickly grasp through the sense of touch the idea of the whole of a large object, or such a thing as a garden or a room, but they can get acquainted with the parts, and the mind makes the combination. The American Museum has had made especially for use with the blind classes small plaster models (one inch to one foot) of elephant, buffalo, giraffe, camel, and hippopotamus, from which an idea of the shape and pose of the whole can be gained before studying the real object. One small blind boy, passing his fingers over the face of "Caliph," the great hippopotamus in the African hall, remarked that it must have a good disposition as the corners of its mouth turned up



PART OF A CLASS OF BLIND IN THE AMERICAN MUSEUM

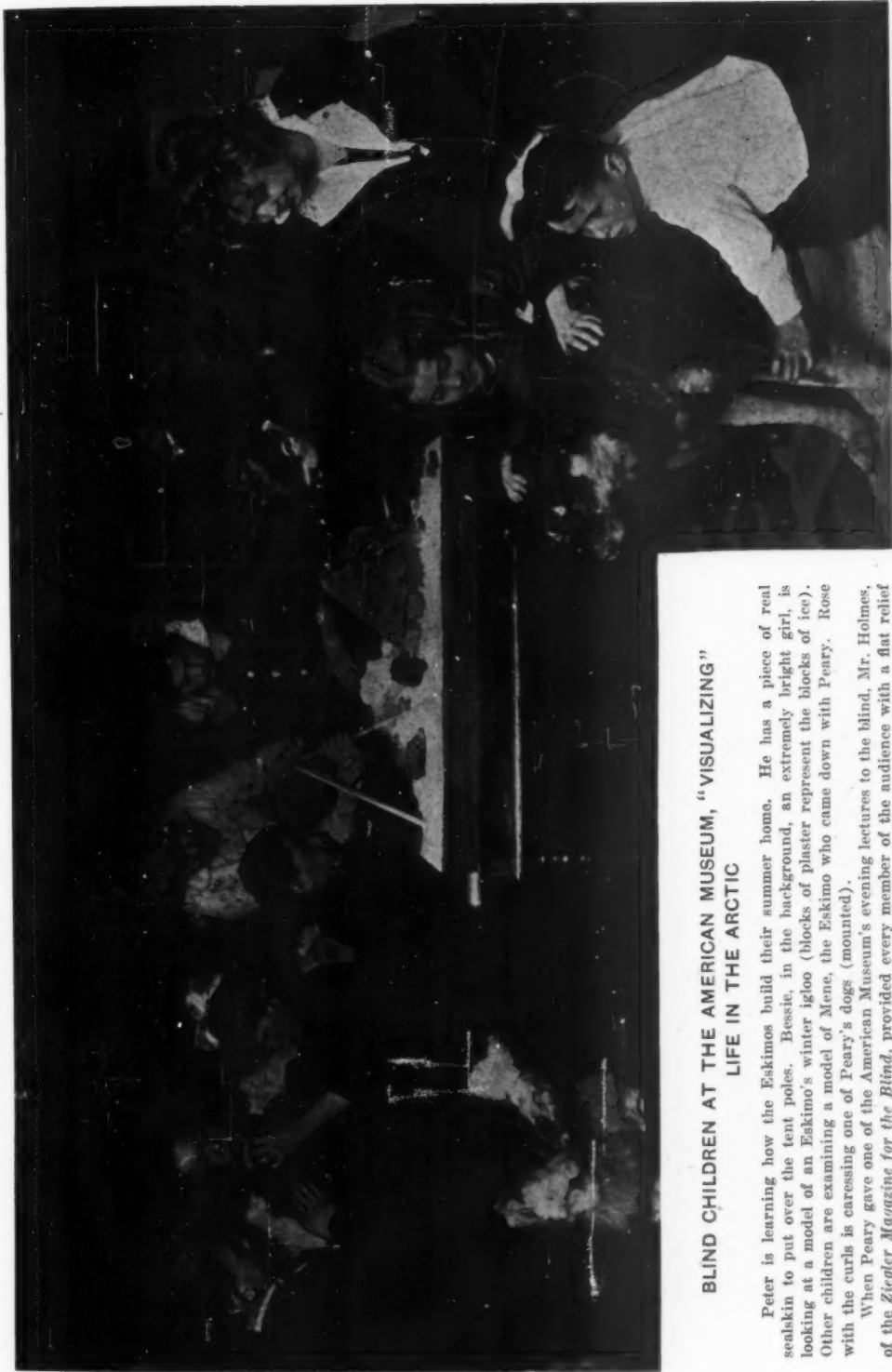
The American Museum can give opportunities to these children not easily found elsewhere. For instance, it furnishes models illustrating methods in the history of transportation,—moccasins, canoes, pack horses, prairie schooners, steam cars, sail and steamboats, hydro-aëroplanes. It also has an accurate model of the Panama Canal. In New York the greater number of blind children and children partly blind come from the homes of the poor. As a rule they are not highly gifted intellectually. In other words they are just like the masses of all other children, except that they start with a definite handicap. The public schools of New York now provide study classes and teachers for partly blind children, with suitable medical attention and provision of raised type. These children, however, recite and receive instruction in the regular classes. Not isolating the children from normal children results in an adaptation for the later time when they must earn a livelihood among normal people



WHETHER FOR HAND OR EYE, A SPIRIT OF INQUIRY IS THE THING

A class at the American Museum with apparatus to show the earth and the sun, direct rays of the sun (represented by wires) and rotation of the earth on its axis. It is easy for the boy's hand to read from this the cause for night and day and for summer and winter. The boy in the middle is not blind but pure albino. He sees with great difficulty because of the flood of light unrestricted by pigment in the iris.

The thousands of blind children in America, too young to go to school or to get the help from classes at the Museum, are wholly dependent on the mother. Will she give the special effort necessary to make her child learn through the sense of touch to know her and carry on normal childish activities in the home, so that for this blind child there will be the same result as for the child who gets its impressions by imitation and the quick understanding of the eye? Every such mother would wish to read Helen Keller's paper on "The Training of a Blind Child" (See *Out of the Dark*, pp. 188-207, Doubleday, Page and Company, 1913)



BLIND CHILDREN AT THE AMERICAN MUSEUM, "VISUALIZING" LIFE IN THE ARCTIC

Peter is learning how the Eskimos build their summer home. He has a piece of real sealskin to put over the tent poles. Bessie, in the background, an extremely bright girl, is looking at a model of an Eskimo's winter igloo (blocks of plaster represent the blocks of ice). Other children are examining a model of Mene, the Eskimo who came down with Peary. Rose with the curls is caressing one of Peary's dogs (mounted).

When Peary gave one of the American Museum's evening lectures to the blind, Mr. Holmes, of the *Ziegler Magazine for the Blind*, provided every member of the audience with a flat relief map showing the Arctic lands and the water about the Pole. The Museum also had ready for examination before the lecture and afterward a number of Eskimo dogs (mounted) hitched to a sledge actually used on one of the Peary expeditions, so that the method of harnessing common in the eastern Arctic might be studied.

Names closely connected with the initiation of work for the blind in New York City are those of Mark Twain and Joseph H. Choate



Photograph by E. O. Hovey

LIKE A STRANGE WARSHIP OF THE NORTH

Great icebergs come from the glaciers at the head of Disco Bay or drift along the coast of Disco Island as they float southward from the glaciers of Melville Bay. Often large fleets of them ground on the bars east of Godhavn, where the sunshine and warm currents break them up into fragments. They burst apart with noise like heavy cannonading and, as the fragments topple over, they set up huge waves that break high and fiercely upon the adjacent shore or die out far from their origin.

The Danish Arctic Station at Godhavn

By W. ELMER EKBLOW

Research Fellow in Geology, University of Illinois, and Botanist on the Crocker Land Expedition, 1913-1916

TO THE perseverance and industry of one man, "a man with a vision," Denmark owes one of her most important colonial institutions, the Danish Arctic Station at Godhavn. Unique among scientific laboratories in its far Arctic situation and in the character of its work, it exemplifies what can be done by a man with a firm conviction and inflexible determination. To Morten P. Porsild, director of the station, who never once wavered from his resolute purpose of establishing upon a firm and permanent basis the scientific survey of Greenland—Denmark's Arctic colony—belongs the credit for making possible much of the research that is yielding such valuable results in the problems of Arctic biology, geology, meteorology, and in the study of the Eskimo. Once he had conceived the plan of establishing the station, he did not rest until it was fulfilled.

The Danish Arctic Station was established as a base from which to prosecute the geographical and geological survey of Greenland, the investigation of its plant and animal life, the study of the various physical and chemical phenomena peculiar to the Far North, and to train young scientists interested in Arctic exploration and research in the technique of northern travel and investigation. It was to serve also as a station to which scientists of lands other than Denmark might come for opportunity to work out special problems presented by the North. In all these aims the station has been unusually successful.

The funds necessary for the establishment of the station were furnished Herr Porsild by private subscription, but after the work had once demonstrated its value, the Danish Government took charge and now appropriates

10,000 crowns a year, not quite \$3000, for the maintenance and activities of the station. This appropriation includes not only Herr Porsild's salary, but all the expenses of equipping and conducting the station, a sum that seems all too small for the many activities in which the director so successfully engages. The station was established in 1905 at Godhavn, on the south coast of Disco Island. Herr Porsild on an earlier journey to Greenland had decided upon Disco Fjord as the best locality in which to build the station, but when the time came for its construction, circumstances determined that Godhavn, farther to the east, in latitude $69^{\circ} 14'$ should be selected.

Godhavn, the capital of the province of North Greenland, is really an excellent place for the station, perhaps the best on the whole coast. The middle portion of the west coast of Greenland becomes almost ice-free early in April and remains so until late in November. Thus Disco Island is usually accessible to ships throughout this period. This fact in itself makes Godhavn a desirable place, but the presence of open water for so long a time each year, and its proximity throughout the whole year, also have a direct influence upon the climate; even in midwinter the weather is not so severe as along the coast farther to the south or north.

In addition to these fundamental advantages, Godhavn possesses for the biologist unique superiority of position in lying beside the "hot springs" for which Disco has long been known. These springs are neither large nor extensive, nor so warm that they modify the general temperature of the part of the island where they issue, but their relatively warm waters, four to five degrees above zero, even in midwinter

seep down through the talus and soil of the slopes and create conditions favorable to the growth of many plants and the life of many invertebrate animals, found elsewhere much farther south. In these warm habitats many life forms have their northern limit.

In summer a most luxuriant vegetation flourishes on the slopes watered by these warm springs; willow heath, waist high, grows almost everywhere over the rocks; archangelica flourishes in the richer soil along the springs themselves, and its young stalks furnish the people with greens not unlike asparagus; ferns of several species are abundant on the rock ledges; and most remarkable of all, five species of the orchid family flourish, flower, and reproduce themselves. Two of them grow in such profusion on the narrow flats along the shore that in walking over them one crushes so many blossoms

that the air becomes sweet with their perfume.

Besides these and the many other interesting plants, numerous rare mosses, many of them of far southern distribution, grow in profusion. Many insects and other forms of invertebrate life likewise find in these warm areas their northernmost home. Two species of earthworms live in this sub-polar outpost, hundreds of miles north of any others of their kind.

In winter when deep snows blanket the island, the snow drifts down from the mountains over the springs. Then the warmth of the water gradually melts out caves and rooms, where even in midwinter flies and snails feed and are active. If a hole be punched in the roof of one of these subniveal caverns, the steam pours out into the frigid air as though a volcano in miniature had burst forth.



Morten P. Porsild and his youngest son.—To Morten P. Porsild, director of the Danish Arctic Station, belongs the credit of making possible much of the research that is yielding such valuable results in the problems of Arctic biology, geology, and meteorology, and in the study of the Eskimo. Even though he is forty-five years old, he can tramp all day with a heavy pack over his shoulder, or drive through rough ice a team of ten unruly Eskimo dogs

Of these spring-watered, hothouse-like plots, Herr Porsild has made reservations where the unusual life forms and luxuriant vegetation may be preserved, and their habitats remain unchanged. He has posted conspicuous signs, with notices in Eskimo, defining the limits of his reservations; since he hunts and fishes almost not at all, he felt justified in explaining to the Eskimo that because he did not disturb their eider duck, or seals, or salmon, they ought to leave to him his plants and bugs. The Eskimos were amused and pleased at his way of putting it, and have respected his reservations most scrupulously.

Godhavn lies on a splendid little harbor quite sheltered from icebergs and the fierce southwest storms that sweep the coast. It nestles at the foot of frowning basalt and sandstone cliffs more than two thousand feet high, cut by two deep gorges near the village. Down one of these gorges flows the Red River, up the valley of which sledging to the interior and across to Disco Fjord is rather easy after the first autumn snowfall. East of the village several seams of lignitic coal outcrop not far from the shore line, and afford an abundance of first-rate fuel. Not far east of the village, too, is the basalt exposure from which telluric iron is obtained; it was this telluric iron that Nordenskjöld considered meteoritic, and which led him to declare that if the pieces he obtained were part of the country rock, then the whole island was a meteorite.

The Danish station at Godhavn is not large but it is very well planned and constructed, and very well furnished and equipped, not only as a scientific laboratory but also as a home for the director and his family, and for the men who work with him there from time to time. It is a frame building about twenty meters long and fifteen or more wide, two stories high. It includes the residence of Herr Porsild,

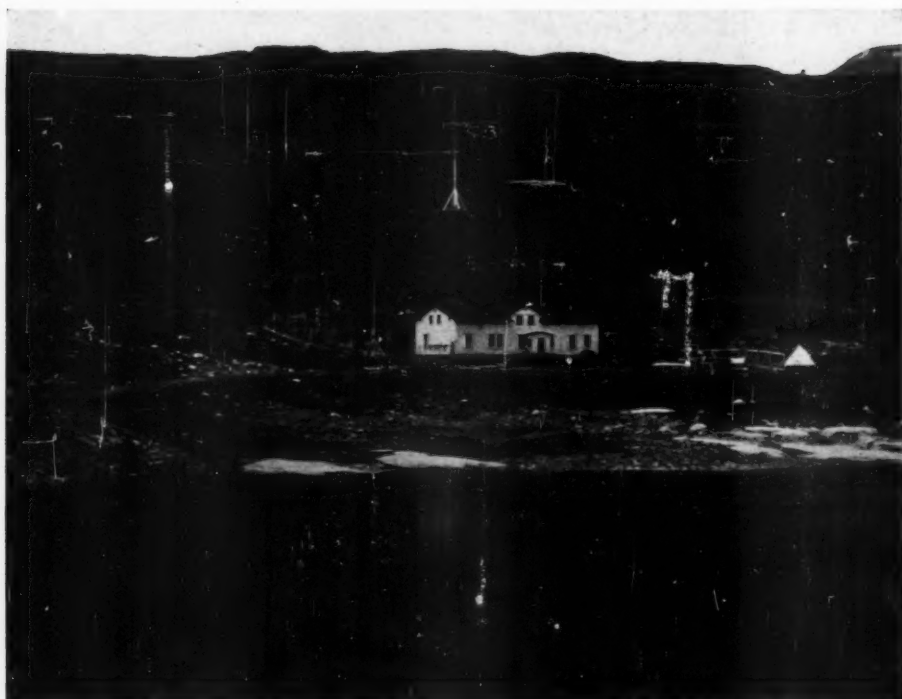
several guest rooms, a large laboratory, an equally large library and herbarium, a good dark room, and a small observatory.

The laboratory is well equipped with chemicals; physical instruments such as balances, thermometers, and barometers; surveying instruments; cameras



Just beyond the boundary of the map at the north is the northern limit of the Danish province of North Greenland and the beginning of Melville Bay. The scenery of the west Greenland coast is comparable with that of Norway; in fact, no other known land of such size as Greenland has so many bold precipices, deep fjords, and valleys along its coasts. Often mountain peaks from six thousand to seven thousand feet high stand less than two miles back from the sea. At Jakobshavn is one of the most active glaciers in the world, with an average velocity of fifty feet a day, discharging great quantities of icebergs into Disco Bay (the glaciers of the Alps average from one to three feet a day).

A Danish government boat makes one trip each summer between Copenhagen and Holstensborg, and attempts to go on to Godhavn, and later to Upernivik if good luck attend it. Communication with Melville Bay and regions farther north is only by special dog sledge from Upernivik, and if weather conditions are bad, often all the way from Holstensborg



Photograph by Morten P. Porsild

The Danish Arctic Station, Disco Island, West Greenland, seen across a backwater lagoon.—The flagstaff in the middle distance is planted on gneiss; the wall behind is of basaltic tufa ("Osterli") with rich vegetation; in the far background at the right may be seen the top of the Skarvefjeld, 3200 feet elevation. Herr Porsild's laboratories are in the right wing of the building, the living rooms occupying the left wing

and photographic material; and nearly all the instruments that a field scientist requires. A powerful motor boat, "Clio Borealis," properly arranged and equipped for dredging as well as for travel, is connected with the station. Running water from the warm springs supplies the whole station nearly all the year.

The library contains thousands of volumes, needless to state nearly all of scientific character. Herr Porsild's friends and acquaintances are legion, and through them he has acquired large numbers of standard works in science, including periodicals, from all parts of the world. By no means exhaustive or complete, his is nevertheless a very good working library.

Herr Porsild, himself, is peculiarly well fitted, both by temperament and training, to direct the activities of the station. He is a powerfully built man, six feet tall, and broad in proportion,

sturdy and healthy as the Viking stock from which he springs. Even though he is forty-five years old, he can tramp all day with a pack over his shoulder, up and down the steep, rough slopes of Disco. He has become an expert dog driver, and throughout the sledging season is out in all kinds of weather and in all kinds of ice conditions, thinking nothing of the hardships or the hazards of the trail.

Under Arctic conditions such as those that surround him, most men possessed of good nature, cheerful philosophy, and genial sense of humor would lose them in a few years, but he has retained all. Throughout the year he is either out of doors busily engaged in investigation and research, or in his library, herbarium, or laboratory, studying or developing the results of his outdoor activities, and it would be hard to find anywhere a man more happy and content in his work and station than

he, more capable of making the most of life.

His family comprises his wife, a capable, motherly woman who undoubtedly has been his strong support in all his undertakings; three sons, of whom two are almost ready to complete their courses in the university at Copenhagen, while the youngest, his father's pet, has not yet left home; and a daughter, who thus far has been taught by her father and mother, in Greenland. To his children Herr Porsild is as kind and indulgent as he can well be, but he maintains a just and rigorous discipline.

Fru Porsild manages her household as thoroughly and scientifically as the master does his station. Her guests are made to feel at home from the moment they enter her door until they leave. She keeps an Eskimo cook and an Es-

kimo maid, both of whom she has carefully trained. Eskimo girls are quick to learn when tactfully instructed, and those in Fru Porsild's service are very efficient. The Danes say that the Eskimo women cannot be excelled as nursemaids. With the aid of these two Eskimos, Fru Porsild is able to keep her home as clean and orderly as if she were in Denmark, the land of scrupulously kept homes.

The three boys are splendid fellows. Of the two in the university at Copenhagen, the elder, Thorbjorn, has followed in the steps of his father, taking up botany as his particular subject; the younger, Erling, is studying to become a merchant. The youngest, the baby of the family, not yet seven years old, is the joy of his father's heart. Thorbjorn expects to take up his father's work some time as director of the sta-



Photograph by Morten P. Porsild

The motor boat "Clio Borealis" of the Danish Arctic Station, lying in front of the glacier Eqip Sermia, 69° 45'. In this motor boat Herr Porsild has traveled far up and down the west Greenland coast during the years he has been engaged in Arctic study and exploration



Photograph by Morten P. Porsild

The face of the glacier Eqip Sermia, discharging into Disco Bay.—The rough cordilleran portion of the surface of this glacier indicates that the ice is afloat over the bottom of the bay

tion. With Godhavn as a base, he is planning to explore and study Baffin Land as thoroughly as Greenland has already been investigated.

Men of many countries besides Denmark who have made this station their headquarters while they have been at work in Greenland, testify to the hospitality and courtesy extended to them by Herr Porsild and his good family. Among those who have stayed at the station at one time or another are Swedes, Norwegians, Germans, Swiss, Austrians, and Americans. Dr. Thorild Wulff, the celebrated Swedish eth-

nologist and botanist who perished of starvation when with Rasmussen's expedition across the ice cap of Greenland last year, has worked there. One of the first men trained at the station was Mr. Lauge Koch, the young Danish geologist, who has apparently acquitted himself so creditably with Rasmussen's expedition. Herr Porsild states that one of the most delightful guests he has entertained was Ossian Elgstrom, the Swedish artist and cartoonist, who spent the summer of 1915 in Greenland studying native art.

The art of the Eskimo is primitive,



Photograph by E. O. Hovey

View of a part of Godhavn, showing the pastor's house and the church in the distance.—The Eskimos are exceedingly faithful in their church attendance, but when the weather is favorable for hunting the men usually do not observe Sunday. This photograph gives a good view of the Skarvetfjeld, one of the commanding headlands along the south coast of Disco Island. Tidal currents are so strong at the base of this headland that the sea ice there is rarely safe for sledge travel and a detour must be made over the highland back of the mountain

but Elgstrom found so much of interest that he has published a highly entertaining book as a result of his studies. Under the encouragement of Herr Porsild a number of Eskimos at Godhavn are attempting to portray their life and environment in water color and crayon; they do very well considering that they must develop their own technique without any instruction or guidance.

That Herr Porsild is thorough in his methods of training young would-be Arctic scientists, no better evidence is needed than the record that Lauge Koch has made as an associate of Knud Rasmussen. Except for the summer that Koch spent with Herr Porsild on Disco Island, he had had no field training whatever until he accompanied Rasmussen by dog sledge from Holstensborg to North Star Bay. Although a novice at sledge work, he drove his own team of dogs the latter half of the trail, lived almost exclusively on seal and walrus meat for a month after having just left the "fleshpots" of Denmark, and successfully completed a most careful survey of the entire shore of Melville Bay.

Now word comes from Greenland that Koch survived a journey which was too much for so experienced and tried a traveler as Dr. Thorild Wulff;—not only survived the journey, but achieved the most important results attained by the party. Herr Porsild said last summer while I was his guest, "Oh, Koch will come out all right! He learned here how to adapt himself to difficult conditions. He found out that Arctic exploration is no child's play, when he was here with me; I sent him out on several long tours with Eskimos with whom he could converse only by signs, with barely enough food to get back safe, and to places where the mosquitoes almost ate him alive. And yet he always did what he set out to do, although I must say there were times when he looked a little rebellious."

The work accomplished by Herr Por-

sild and the other men who have made the station their base is extensive. Herr Porsild has already published many important papers, not only in botany, but in zoölogy, anthropology, ethnology, and divers other sciences. He has completed exhaustive studies of the flora and the vegetation of the west Greenland coast; he has studied the habits of the Arctic salmon, of the caribou, of the narwhal; he has investigated many of the old Eskimo ruins and kitchen middens, and delved deep into former and present arts and customs of the Eskimo; and he knows the history and geography of Greenland as no one else



Photograph by E. O. Hovey

Two native Greenland women living at Godhavn.—Their richly adorned trousers and boots are almost their chief pride. Usually they wear also a heavy bead collar of complicated design that extends down over the breast, shoulders, and back

knows it. Even now he has great volumes of manuscript ready for publication. To the series of studies which the government of Denmark plans to issue in 1921 to celebrate the two hundredth anniversary of the Danish occupancy of Greenland, Herr Porsild will be one of the most prominent and extensive contributors.

While I was staying at his station he worked every day, and regularly far into the night, on two comprehensive reports which he was then preparing for the anniversary series. One of them was a "Phytogeography of Greenland" and a study of the origin of the Greenland flora, and the other, a complete history of Greenland which he was preparing in collaboration with Pastor Osterman of Jakobshavn. This latter work necessitates a study of all the old records and documents in the archives of the Royal Danish Greenland Company and those of the Danish Government.

Generally Herr Porsild is busy at field work throughout the summer, traveling along the coast in his motor boat. Both northward and southward he still has large unknown fields to engage his attention, many problems for which to find the solutions. In winter he is often kept to the station for weeks at a time by storm or bad ice, but whenever sledging is possible he is loath to stay indoors.

His particular hobby is road making. From the wharf where the ships unload their cargoes and take on the blubber and skin, to his scientific station, is a distance of almost, or quite, a kilometer, the way leading over rock ledges, little bogs, and around little embayments. All this distance he has built a roadway, a genuine Roman highway, of rock and sand filling. He has built it up over the bogs, and blasted it through the rock ledges, until now it is smooth and level as a boulevard.

Like all Danes he is intensely patriotic, and although he is not so provin-

cial as to consider Denmark the only God's country on the globe, he would be reluctant to make his home in any land except where waves his beloved "Dannebrog," the venerated national flag of the Danish people. On all special occasions, on all holidays, and whenever a ship comes into port, the rose-red flag with its white cross must be raised on the tall flagpole above the station. And in nearly every room of the station, as in all the Danish homes in Greenland, stands a conventional little metal flagstaff with a miniature "Dannebrog," constant reminder of the homeland.

For Germany Herr Porsild can have but little sympathy. Exiled from his home in Schleswig not many years after the Germans seized the province, he cherishes a deep grievance against the conquerors. But he says little about the matter; not so, however, his assistant, Herr Nielsen, or the governor, Herr Olsen. Both of these men have been hussars in the cavalry regiment of Captain J. P. Koch, Danish army officer, famous because of his Arctic explorations, to whom the word "German" is said to be a red flag.

Among the Eskimos of the coast, Herr Porsild is considered a remarkably good man. He can converse with them in their own language, and never fails to help them whenever the circumstances justify aid, and his means and facilities permit. In times of accident or illness he is their emergency physician and surgeon. A few years ago when the dread "cadaver infection" seized the natives of the village, he did all he could to stop its ravages, without thought of his own danger. After successfully evading infection for several days, he finally contracted the disease. One of his hands showed that it had attacked him there; like a Spartan he stripped off all the skin on the back of his hand, and saved himself.

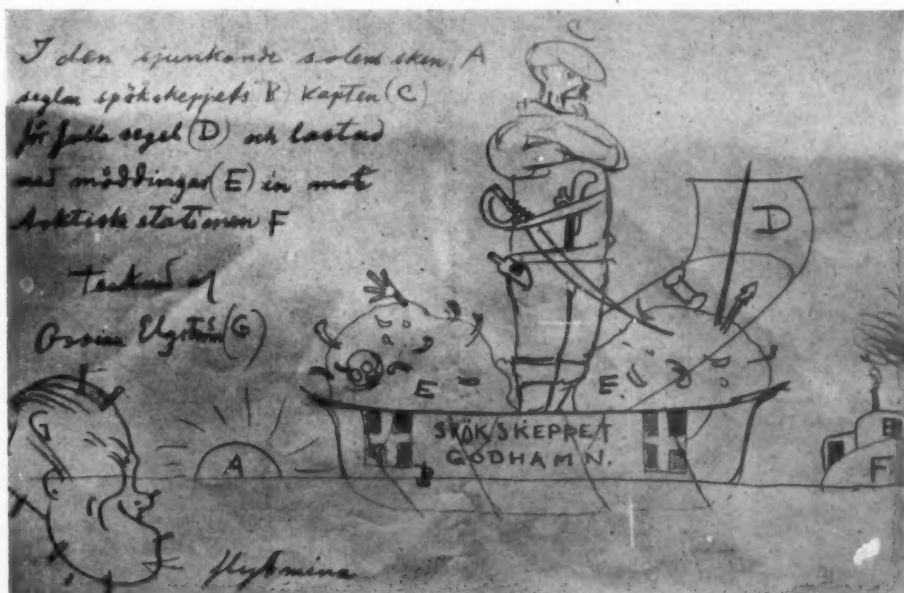
It is by such ministrations and experiences as these, and by his sound,

careful advice, that he has won the confidence and respect of the natives, in like measure as he has won the friendship of the Danes. The Eskimos come to him with all their tales, and traditions, and discoveries—a constant mine of information and data for him.

Few men are better versed in the tales and traditions of the Eskimo than he. And of tales and legends they have legion. One of the most interesting stories accounts for the southern flora and fauna of the island. They say that Disco with its luxuriant vegetation at one time lay much farther south, off a prosperous village. In this village dwelt a great hunter who was also a sorcerer. Tired of going around this island every time he went out to sea, he finally decided to tow it away. By his magic power he was able to do this without trouble. Pulling a hair from his head he attached one end to the island and the other to his kayak, and started northward. He proceeded without mishap until he reached the spot where the

island is at present situated. Just as he was about to pass Nugsuak Peninsula, an old woman, a rival magician, laughed derisively to see him working so hard. Her ridicule spoiled his charm, the hair by which he was towing broke, and Disco settled to its present site. Ever since that time, the island has retained its southern climate and vegetation.

If the Eskimos were still as superstitious as they used to be, Herr Porsild would surely seem a magician or *angekok* to them. And in all truth they would not be far from right. By the magic of his purposeful character and determined personality, he has achieved the establishment of his station and the wonderful results that have come from it. To him and others like him is due much of the extensive knowledge we have of Greenland, knowledge much more thorough and complete than our knowledge of Labrador or the regions about Hudson Bay, territories much nearer to us, and much more accessible.



Hitherto unpublished cartoon by Ossian Elgstrom, the Swedish artist.—Translation: In the rays of the setting sun (A) the specter ship—referring to the specter-like transparency of the little Eskimo skin boat (B)—with its captain, Herr Porsild (C), and its sails all set (D), and laden with kitchen-middens rich in material for archaeological study (E), sails toward the Danish Arctic Station (F). Drawn by Ossian Elgstrom (G), a floating mine



Photograph by Morten P. Persild

FROWNING BASALT AND SANDSTONE CLIFFS

Great cliffs more than two thousand feet high, on both sides of the Waigat, give to that narrow passage of the west Greenland coast a scenery as grand as any in the world. The photograph was taken at an altitude of one thousand feet over the sea on the south coast of the Nugsuak Peninsula. The formation shows fossiliferous sandstone overlaid by basalt



Photograph by E. O. Hovey

ICEBERG GROUNDED NEAR ENTRANCE TO GODHAVN HARBOR

This iceberg was photographed in the summer of 1915. The arch is probably a remnant of the walls of a subglacial stream. For two weeks of the summer of 1917 another beautiful iceberg arch, strikingly suggestive of the *Arc de Triomphe*, lay off Godhavn Harbor. The shapes assumed by icebergs are innumerable and fantastic



Photograph by E. O. Hovey

A LOOKOUT HOUSE OF WHALE BONES BUILT A CENTURY AGO

The entrance to the ancient harbor of Lievey (this name, given by the navigator Scoresby, being afterward changed to Godhavn) is around the low ridge at the left. The harbor has been used for three hundred years by all Arctic expeditions. The beacon or "lookout house," about a mile from the point of land at the mouth of the harbor, is made of whale bones and turf. It was erected about one hundred years ago by whalers who made the harbor their hunting base. The lookout stayed in the house while he kept careful watch over the sea for any whales cruising about. Whenever a whale appeared the lookout signaled to his fellows on the ship in the harbor by firing a small cannon that is still in position. Carved on the walls of the hut are the names of many visitors to Greenland, some of them famous in exploration. A few years ago, when the Danish Government repaired the hut and painted it as a beacon with the design of the Danish flag, the names and initials were as carefully preserved as possible



Photograph by Sergeant G. W. Rice
Courtesy of Charles Scribner's Sons

A GENERAL VIEW OF GODHAVN HARBOR

Innumerable splendid harbors may be found along most of the west coast of Greenland when the ice is gone. This shows the harbor of Godhavn in summer, from an elevation on the northerly shore. The water reaching to the horizon is Disco Bay extending into Baffin Bay. The settlement at Godhavn may be seen at the left of the center, on the far side of the harbor. Since this picture was taken, in 1880, the narrow passage of water across the cape has been obstructed by the elevation of the area, so that only in severe storms does water extend quite across. (A woodcut from this photograph was published in 1886 in Greely's *Three Years of Arctic Service*, Vol. I, p. 28.)

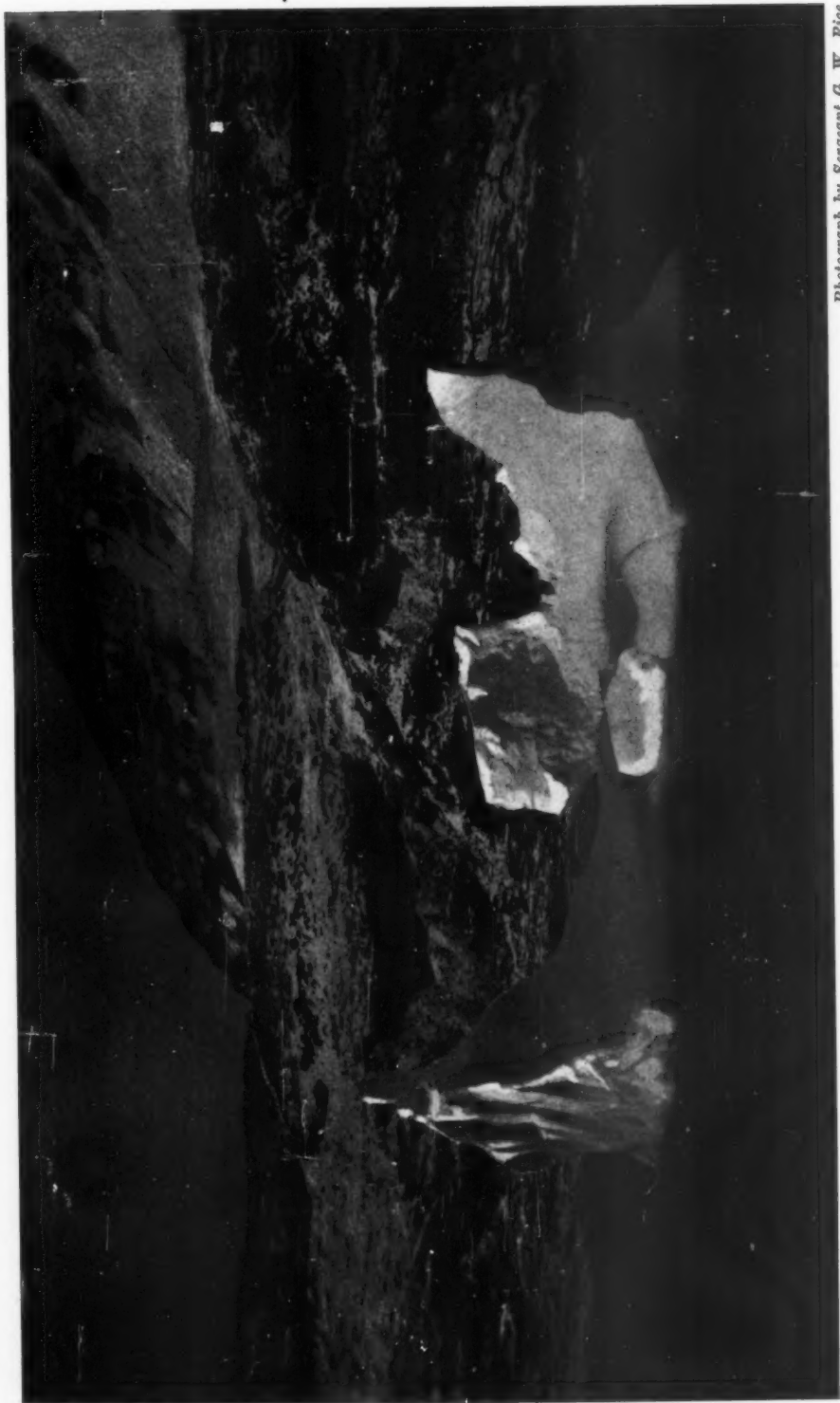
This illustration and the five immediately following are from photographs taken by Sergeant George W. Rice, official photographer of the Lady Franklin Bay Expedition, known as the Greely Expedition, which went north on the S. S. "Proteus." The photographs were made in 1880 and 1881, by the wet plate process, on 8 x 10 plates. The plates were left at Fort Conger, where they were found by Admiral Peary, together with all the relics abandoned by Greely when he retreated from Fort Conger to Cape Sabine in 1883, and were brought to the United States in 1902



Photograph by Sergeant G. W. Rice

GODHAVN IN 1880

A detail of Godhavn Harbor after a snowstorm in summer, showing the buildings of the settlement



LAST CHAPTER IN THE STORY OF A GREENLAND ICEBERG

Occasionally, under the influence of wind, small broken-down icebergs drift into the harbor of Godhavn

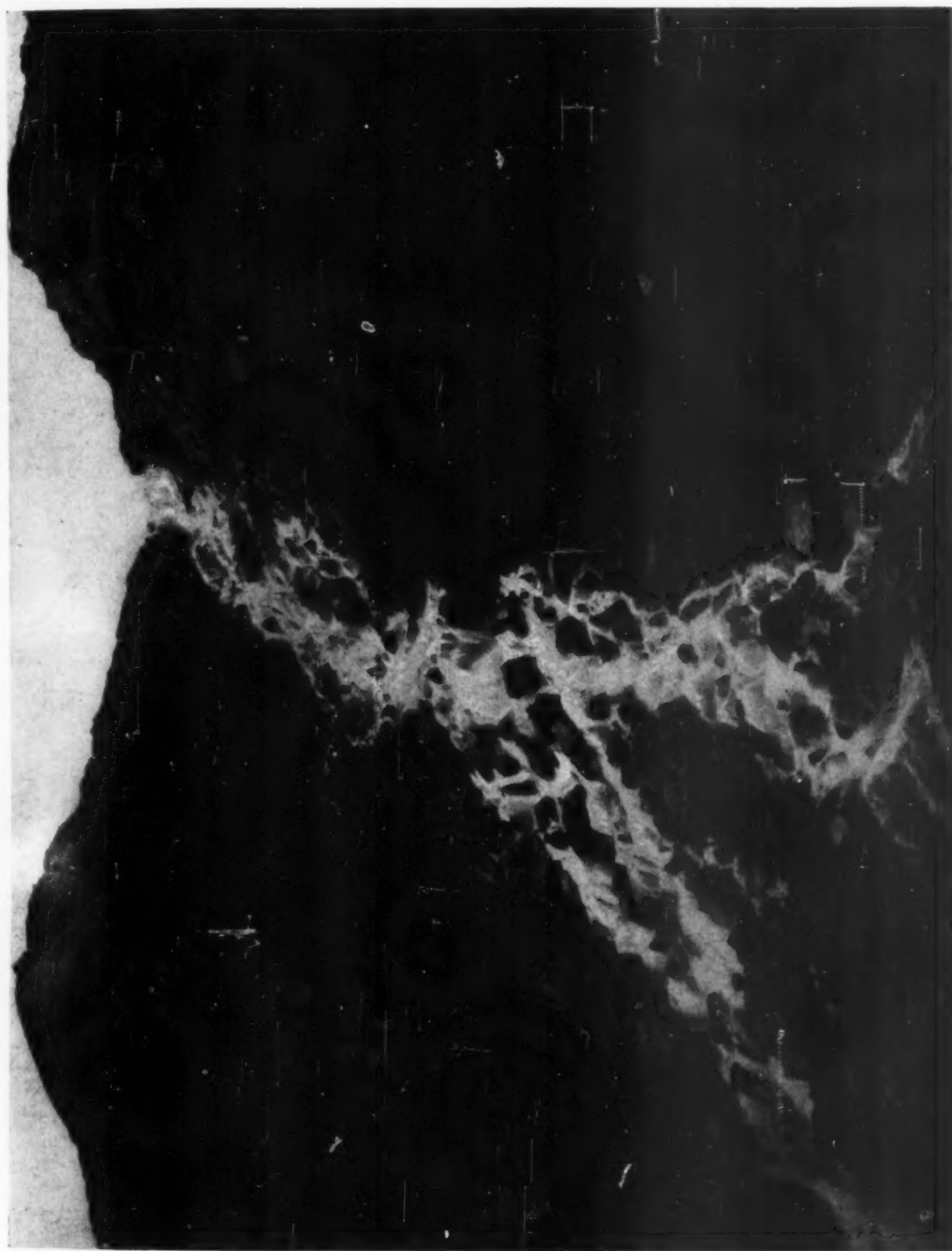
Photograph by Sergeant G. W. Rice



Photograph by Sergeant G. W. Rice

NORTH SHORE OF GODHAVN HARBOR AFTER A SUMMER SNOWSTORM

The mountains forming the background to the north of Godhavn Harbor show the innumerable layers of basalt one above another. High at the left can be seen one pinnacle of basalt left standing of the twelve which were there at the time of Scoresby's visit. He christened them "The Twelve Apostles." In the three hundred years since that time, eleven have disintegrated and crumbled away, leaving the present monument, the last "Apostle"



AN ARCTIC WATERFALL

There are numerous such streams from the heights on the north side of Godhavn Harbor, where the flow of water is temporary, however, lasting only until the snowcap has been melted away. Farther north Disco Island has a permanent ice cap

*Photograph by Sergeant G. W. Rice
Courtesy of Charles Scribner's Sons*



Photograph by Sergeant G. W. Rice

PAN ICE AT GODHAVN AT THE TIME OF THE GREELY EXPEDITION

Looking eastward in Godhavn Harbor, showing the ice breaking up in the summer of 1881



Photograph by Ensign Harlow

ADMIRAL SCHLEY'S RELIEF SHIPS AT GODHAVN

Ships that were under the command of Admiral Schley on their way to rescue the Greely party in 1894.—In later years Admiral and Mrs. Peary stopped at Godhavn, climbed the mountains, and built a cairn on the crest of the snowy ridge to the left of the point on which stands the last "Apostle," a cairn which is still standing although the record they placed in it has been removed. A beautiful glaciated knoll of the gneiss on which Godhavn is built appears in the foreground

Stefánsson Returned After Four Years of Arctic Exploration

By CLARK WISSLER

THE Arctic explorer, Vilhjálmur Stefánsson, visited New York and lectured at Carnegie Hall for the benefit of the American Red Cross, October 31, on the experiences and results of his 1913-1918 Canadian Arctic Expedition. One object of this expedition was the discovery of new land above the known Arctic Archipelago. It had been thought that perhaps a large body of land lay off the north Alaskan coast and the seeking of this land was the main purpose of the Northern Section of the expedition, the Southern Party making scientific explorations of the country around Coronation Gulf.

New land was found by Stefánsson, but in the form of three new islands on the upper border of the Arctic Archipelago. This discovery adds a considerable area to the known land surface of the earth, about three thousand square miles. On the other hand, the position of these new islands indicates that they are the outer edge of the great archipelago just off Hudson Bay, and Stefánsson's soundings offshore seem to indicate deep water, thus suggesting that no new land is to be expected in the unknown area north of Alaska.

The First New Land, of about the size of Ireland, discovered June 15, 1915, was fully surveyed in 1916. It lies between Prince Patrick and Ellef Ringnes islands, with its western tip at $77^{\circ} 55'$ N. latitude and $114^{\circ} 30'$ W. longitude, its extreme northwestern corner at 79° N. and 113° W., and its eastern tip approximately at $78^{\circ} 30'$ N. and 108° W. The various prominent land angles, capes Murray, Malloch, Mamen, Beuchat, and Mackay, have been named in honor of scientists on the "Karluk" who lost their lives.

The Second New Land was discovered on June 13, 1916, between Ellef

Ringnes and Axel Heiberg (its northern tip lying in $80^{\circ} 12'$ N. latitude and 100° W. longitude)—with several smaller islands off the east shore between the new land and Axel Heiberg. The Third New Land, discovered on August 3, 1916, occupies with the First Land the sea north of Melville Island. By looking at the map it will be seen that these new islands lie in a line with Prince Patrick Island, Ellef Ringnes, Axel Heiberg, and Grant Land, forming what would seem to be the abrupt edge of an archipelago platform. Stefánsson reports that all the new lands as well as Ellef and Amund Ringnes islands show clear evidences of extensive elevation of coast lines, which is still in progress.

Of very definite scientific value will be his tidal observations, with instrumentally determined local time at Cape Isachsen, Hassel Sound, and the southern tip of the Third Land, tied up with observations at the historical Parry Rock at Winter Harbor on the southeastern coast of Melville Island, where tidal observations were made in the summer of 1820. Tide records were kept also at Cape Kellett on southwestern Banks Island, and in Prince of Wales Strait.

Another important work of the expedition was the mapping and correcting of formerly delineated coast lines and surveys in the Arctic Archipelago. A stretch of about fifty miles was charted along the eastern coast of Prince Patrick Island, that McClintock and Meham did not cover when working in the region sixty-five years ago. The northeast corner of Banks Island, at John Russell Point, was found to be mapped a full degree too far east. The coast of northeastern Victoria Island, which the work of Hansen and Ristvedt had left incompletely explored, was mapped by a party under Storker Stor-

STEFANSSON'S AND MAC MILLAN'S RECENT EXPLORATIONS IN THE AMERICAN ARCTIC ARCHIPELAGO

Scale 1:9500 000
100 50 0 100 200 300 miles

Routes

Canadian Arctic Expedition Northern Division Crocker Land Expedition

Stefansson Mac Millan
Storkersen Ekblaw

• Base or winter quarters

All routes are approximate, and
Stefansson's 1916 routes are conjectural



Revised from THE GEOGR. REVIEW, MAR. 1918

Courtesy of The American Geographical Society of New York

kersen, the western part of it in the winter of 1915, and the eastern part in the summer of 1917, with the discovery of an island about twenty miles in diameter. The coast lines of Isachsen Land also were checked up and rectified.

When proceeding southward from the Second Land in July, 1916, over the ice of Hassel Sound, he reached King Christian Island ($77^{\circ} 41'$ N. latitude), his route here crossing MacMillan's from the east. Stefánsson continued southward to Finlay Island (77° N. latitude), finding a small new island between Finlay and Paterson. His work here breaks up the supposedly large island of eighty miles diameter shown on the Admiralty Chart, Isachsen's combined King Christian and Finlay islands (1901), proving them two widely separated, very small islands (King Christian 15 miles diameter, Finlay 12 miles) with a sea depth of 172 fathoms between. Much work was done in a survey of the interior of Banks Island. Large lakes were discovered, rivers traced, and the watersheds of the island marked.

Like all other such heroic undertakings, the story of this one is full of incidents of a thrilling nature. One is the finding of a copper tube enclosing a record of the McClure Expedition, deposited on the northern shore of Banks Island in 1851. The document is signed by McClure and announces that from the given spot (John Russell Point) he saw the waters of Melville Sound and thus discovered the "Northwest Passage." Stefánsson had intended to return to civilization by way of the Northwest Passage and the well-sailed route to the St. Lawrence. Although he was not able to do this through failure of his ships to cooperate with him, he gives it as his opinion from observations of ice movements, that navigation is no more likely to be hazardous or interrupted by this eastern route through Prince of Wales Strait and Melville Sound than by the

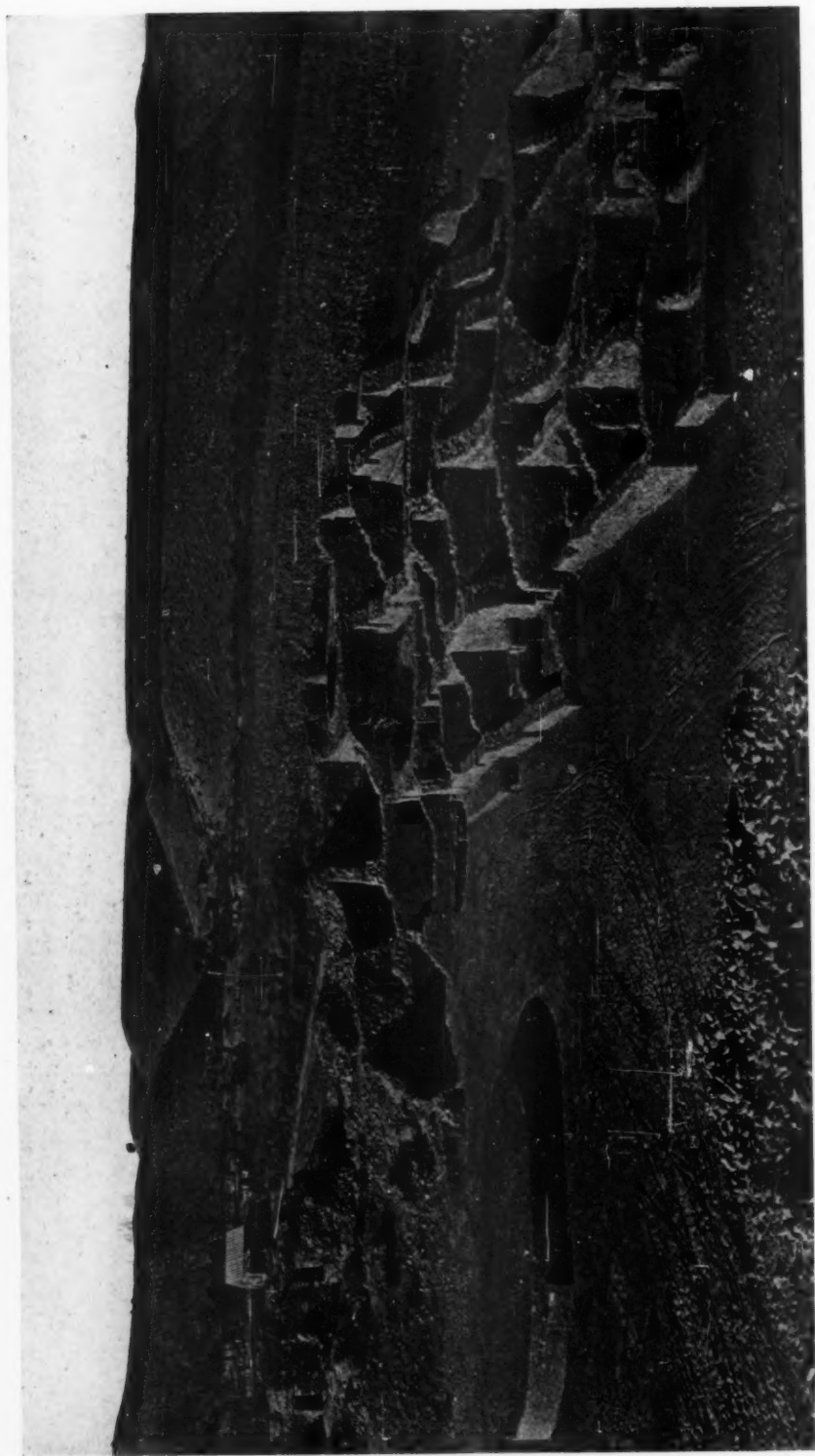
western route with the rounding of Point Barrow.

At Dealy Island off the southeastern shore of Melville was found an old food cache of the Franklin Search days, placed there by Captains Kellett and McClintock in 1853. Strange to say, a great deal of the food was still usable.

Bituminous coal was discovered in many localities, for instance, at both of the expedition's two camps on Melville (at Liddon Gulf and Cape Grassy). Generally speaking, no driftwood, such as has come from the Yukon and Mackenzie rivers and is to be found on Banks Island and along the mainland, was discovered in any of the new lands. Also no musk oxen were found in any of the new islands or in Ellef or Amund Ringnes; and no traces of bears were seen in these regions except on the southern coast of Ellef Ringnes Island; while the species of caribou is only about one half the size of the caribou of the mainland. Bears, musk oxen, and caribou abound on the eastern coast of Melville Island.

Stefánsson has established his ability to live and to have his expedition live on the resources of the North Polar country for an indefinite length of time. He has carried forward the work of his expedition for four years, often with very large parties of white men and Eskimos, without the loss of a single man in the field parties; and what is most remarkable in the light of previous polar history, without the death of a single dog from starvation or disease.

Mr. Stefánsson has been delegated by the Canadian Government to proceed to the Pacific Coast to pay off the crew of the "Polar Bear," lately arrived in port from the North. He is expected to return shortly to New York City to prepare a final report upon his scientific observations to be submitted to the Canadian Government. It is hoped that he will give the JOURNAL the pleasure of publishing an account of some phase of his remarkable work.



EXCAVATED AREA OF THE AZTEC RUIN, 1917

Ponderous walls rising in their dignity from the midst of cultivated fields attest the original magnificence of the structure of which they were a part. Compare with diagram on the page opposite. The drum-shaped building in the left foreground is all that shows above ground of a subterranean clubhouse or ceremonial chamber the interior of which is shown in the illustration on page 604

Further Discoveries at the Aztec Ruin

By EARL H. MORRIS

Illustrations from photographs by the Author

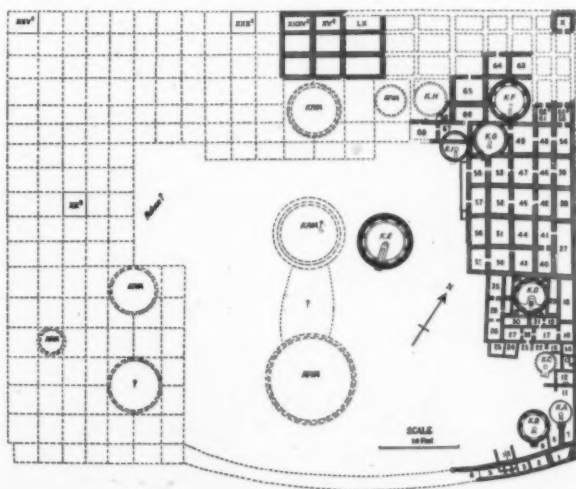
INTRODUCTORY NOTE.—An article appeared in the *AMERICAN MUSEUM JOURNAL* for February, 1917, describing the great prehistoric Pueblo community-dwelling in northwestern New Mexico, commonly known as the Aztec Ruin, and the conditions under which its excavation was begun by the American Museum of Natural History. The March number of the *JOURNAL* for the same year contained a brief discussion of the more important specimens which were unearthed in the now famous ruin during the field season of 1916. Since these articles were written, the Museum's expedition has spent six months (previous to the summer of 1918) in intensive exploration of the Aztec Ruin, and for the benefit of those who wish to keep in touch with the progress of the work, the following description is given of the results of the field season of 1917.¹—THE AUTHOR.

SIXTY-NINE secular rooms and eight ceremonial chambers, comprising a part of the south wing, all of the east wing, and a part of the north wing of the Aztec Ruin, now stand completely freed of debris. The ponderous walls, stripped of the shroud of earth which for centuries protected them from the elements, and more recently from the even less considerate hand of man, rise clear before the eye of the visitor, their battered dignity attesting the original magnificence of the structure of which they were a part.

A glance at the accompanying map gives a more definite image of the ground plan of that part of the ruin which has been excavated, and its relation to the area which remains to be cleared, than can be imparted by written words. The excavated part falls into three divisions, based upon differences of masonry and relative time of construction.

The southeast corner of the ruin, that is, the convergent extremities of the east and south wings, was carelessly constructed of

cobblestones and adobe, the latter in some places having been used to the exclusion of more durable materials. Consequently the disintegration of these walls was rapid, and today none of them is more than four feet high. What relation this poorly built section may have borne to the main structure offers a perplexing, but an important problem. Because of the identity of construction with the evidently more



Ground plan of the Aztec ruin showing the relative proportions of the excavated and unexcavated sections at the close of the field season of 1917. Shaded walls indicate the parts of the ruin which are cleared (see cut on opposite page). Comparison of this chart with that of 1916 (appearing on page 86 of the *JOURNAL* for February, 1917) will show the amount of work accomplished during the season of 1917

¹ Publication of this article has been delayed until the work of the season of 1918 is nearing completion. For facts on the more recent excavation and reconstruction of the Aztec Ruin, see note which will appear in the December issue of the *JOURNAL*.—THE EDITOR.

ancient small ruins which surround the pueblo on all sides, at first one would be inclined to correlate these walls with an older structure which underlies the southeast corner of the pueblo, but inasmuch as they form a definite and integral part of the great ruin, it seems more justifiable to suppose that they represent temporary buildings, hastily erected to complete the predetermined outline of the fortress-pueblo and poorly constructed because they were intended to be torn down to make way for the more permanent, compact, many-storied buildings which the demands of a growing population necessitated.

Adjoining these tumbled-down walls on the north there is a series of rooms, numbers 16-36 inclusive, whose masonry, although much superior to that described above, is markedly inferior to the masonry of the main ruin. This inferiority is due, however, not to a lack of skill on the part of the masons, but to the choice of building material. The walls were erected of iron concretions which weather out of the clay strata of neighboring hills. Intensely hard, and irregular in shape, they could not be faced with primitive tools, and walls built of them were of necessity rough and unlovely to the eye. On the



A kiva with reconstructed roof.—The entrance is through a hatchway in the center of the roof (see view above ground on page 602). The excellent architectural principle involved in the construction of this type of covering for a circular chamber is one of the highest tributes to the mechanical skill of the ancient Pueblos. Pillars of masonry support the roof, which is a cribbing of timbers in the form of a truncated cone. With its flat top and sloping sides, this sort of roof has the strength and permanence of a dome, and the neatly dressed timbers placed in regular rows impart beauty and dignity to the chamber which they enclose



A kiva or ceremonial chamber at Aztec in process of excavation.—The charred contents of this chamber told of a grim catastrophe. At one side of the room lay a few calcined bones of an adult, and against the opposite wall were clustered the carbonized bodies of four children. Bones and flesh were reduced to slaglike masses of charcoal, rendered bluely iridescent by burning body fats; coverings of cloth and matting were fused to the flesh, retaining perfectly their original texture. Pottery vessels, bone and stone implements, and ornaments of shell and turquoise were scattered about the room, where last used or laid aside. Apparently the five individuals were overwhelmed and burned alive together with most of their material possessions



A burial chamber in the east wing at Aztec.—The bowl and vase appearing in the lower right hand corner of the photograph were resting upon the breast of a skeleton covered from throat to thighs with beads and pendants. To recover these last the earth was passed through screens. First one with quarter inch meshes was tried, then one made of window screening. As many of the beads were so small that they passed through even such fine meshes without difficulty, the earth was sacked and taken to camp, where one patient assistant labored for seven days with a flour sieve and a magnifying glass before the last of the beads was separated from the black dust. There were seventy feet of them when strung—more than forty thousand in all



In this section through refuse which had lain buried for five or more centuries can be seen a plaited yucca sandal, a wooden disk strung on a long cord, and packed all about them corn husks, yucca leaves, and strips of cedar bark. As if by a conspiracy of nature the five feet of refuse of vegetable origin which covered the floor of one room at Aztec had been completely shielded from dampness, and from it were taken a quantity and diversity of ordinarily perishable specimens never surpassed in the history of southwestern exploration

contrary, the kiva (ceremonial chamber) belonging to this part of the house, built of quarried sandstone, is as

neat a piece of construction as has been found in the entire ruin.

Because of the thickness of the standing walls, and the depth of the debris which was removed, it seems indubitable that the structure of which rooms 16-36 give the ground plan was at least two stories in height. The east wing was built long before this section was erected, as proved by the fact that three feet of refuse of human origin had accumulated on the ground occupied by the later structure before its foundations were laid. One may venture the statement that this "unit house" was an architectural unit added to the pueblo to accommodate a social unit—a family, clan, or secret society—which desired to become affiliated with the larger village and had been received as an integral part of the community.

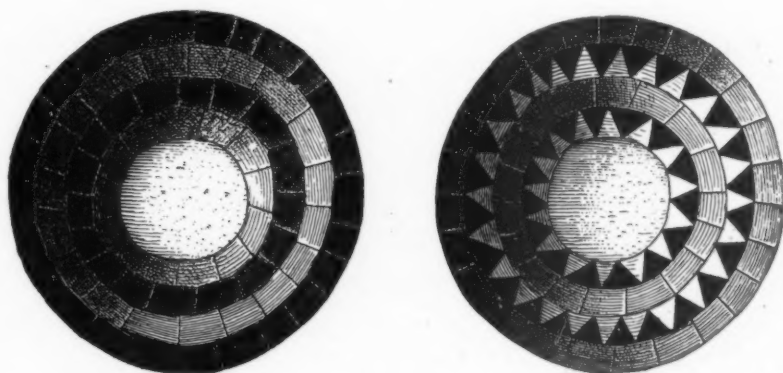
The remainder of the ground plan of the excavated area, namely, the main east wing and the east end of the north wing, seems to have been built at about the same time. The longitudinal walls are continuous, and the masonry uniform throughout. Quarried sandstone blocks are the building material, and these were faced and laid with admirable precision. In this quarter the pueblo was at least three stories in height, descending terrace fashion toward the court. Some of the walls stand to a height of twenty feet—well up on the second story. Two rooms (59 and 61) on the ground floor retain their original ceilings of cedar beams covered at right angles with smaller poles, and sur-

mounted by a layer of adobe mud which formed the floors of the rooms above.

A very long period of continuous, or at least of recurrent occupancy, is denoted by the successive decay and rehabilitation of the northeast corner of the pueblo. Walls collapsed, ceilings fell, quantities of refuse were thrown into the abandoned chambers, and then new floors were laid over the debris, and new walls were raised above the partly ruined structure, some conformable

especially those of the upper stories. The thick usually unbroken walls offer such formidable barriers to the spread of a conflagration that it seems evident that fire was intentionally set from room to room.

The upper several feet of the walls, although held in place by the debris which enclosed them, were greatly disintegrated by the action of frost and moisture. In addition in many places strains developed before the actual collapse of the higher walls had so weak-



Mosaic pendants were fashioned with great skill and evince considerable artistic appreciation. Twenty were found upon the breast of one skeleton. In each case the inlay was applied to the convex surface of a disk of shell, the individual fragments being held in place with pitch. These two mosaics have central disks of pink stone. Alternating concentric rings of turquoise and gilsonite (a jetlike substance) complete the design of the left disk, but in the right one a fourth element was added. The first and third rings consist of alternate triangles of gilsonite and galena crystals, and the second and fourth of turquoise

with the older walls, some resting upon the artificial fill. Such secondary construction is apparent where kiva F now stands. Detritus from the upper walls completely filled the rooms of the first story. During the process of rehabilitation, the debris was leveled, obstructing partition walls were torn out, and the foundations of kiva F were begun at the level of the original second story, about eleven feet above the court. In consequence this kiva stands perched high in the air, not subterranean as was the normal position of these ceremonial chambers.

With few exceptions fire consumed all of the ceilings of the east wing,

ened the remaining parts that they would not have stood long after the earth was taken away from them. The tops of all the walls were removed, and those that threatened to fall were torn down and replaced with new masonry, so that as the repaired part of the ruin now stands it will remain for a long time without much decay, a monument to its aboriginal builders.

Kiva E, situated in the open court, is one of the most interesting of the chambers which have been excavated because of its rather close similarity to the kivas still in use among some of the Pueblo towns of the Rio Grande Valley. Although mostly subterranean, to allow

for the covering of the conical roof with earth, a concentric retaining wall, slightly greater in diameter than the kiva itself, was erected above ground. In order to give an idea of the features of a completed kiva and to present the architecturally excellent method by which these circular structures were covered, the roof of kiva E was reconstructed as shown in an accompanying illustration.

A gratifying number of specimens were found in all parts of the ruin which have been opened—so many in fact as to surpass all expectations. Nearly every room yielded something which will contribute toward the ultimate reconstruction of the material culture of the Pueblos of the Aztec region, even to its most intimate detail. A few discoveries merit individual mention.

The contents of kiva D were mutely eloquent of tragedy and destruction. Fire had raged in the furnace-like chamber, and had consumed or thoroughly carbonized everything inflammable that it contained. On the floor at one side of the room lay a few bones of the calcined body of an adult, and against the opposite wall were clustered the charred remains of four children. Burned to a crisp, these little bodies came out in chunks of slaglike substance, pitted and honeycombed by bubbles of gas, and bluely iridescent from the burning of the body fats. The carbonized cotton cloth of garments, and rush matting, were fused to the flesh and still adhered, retaining perfectly their weave and texture. Strewn about the floor as they were last used were many articles of household economy, cooking pots around the fireplace, food bowls and drinking vessels leaning against the walls, smaller bowls and ladles in cupboard-like niches in the masonry, and stone axes, bone implements, beads and ornaments scattered here and there where they had been carelessly laid aside.

Of several possible conclusions one seems most acceptable. These five persons were trapped and burned alive in the kiva, either by accident, or by the hand of enemies. As it would be next to impossible for the roof of a kiva to catch fire accidentally, it is almost certain that, perhaps for superstitious reasons, enemies within the village sought to destroy these unfortunate creatures, or that they were the victims of an attacking party that stormed and burned a part of the pueblo.

Room 41 was one of the richest burial chambers which have been found in the entire Southwest. In common with the other rooms of the east wing, after having ceased to be used as a dwelling place, refuse was thrown into the abandoned chamber. When about twelve inches of ashes and potsherds had accumulated on the floor, for unknown reasons it was desired to put away the dead in this room. The ashes were scraped from along the south and west walls into a heap in the center, and the bodies of at least two adults and three children were laid in the shallow depressions. The high station of these individuals may be judged from the quantity and variety of mortuary offerings which accompanied their mortal remains. More than forty pottery vessels were grouped around the bodies—food bowls, drinking mugs and pitchers, tiny cooking vessels, dippers, vases, and graceful jars shaped like the bodies of birds, each with a head in full relief. Piles of arrowpoints, sticks of pigment, both red and yellow, and hundreds of long polished bone tubes were interspersed among the pottery.

About fifty thousand beads and articles of personal adornment were the most conspicuous element of the mortuary offerings. One body was covered from throat to thighs with beads and pendants. Strands of turquoise lay against the skull where they had been

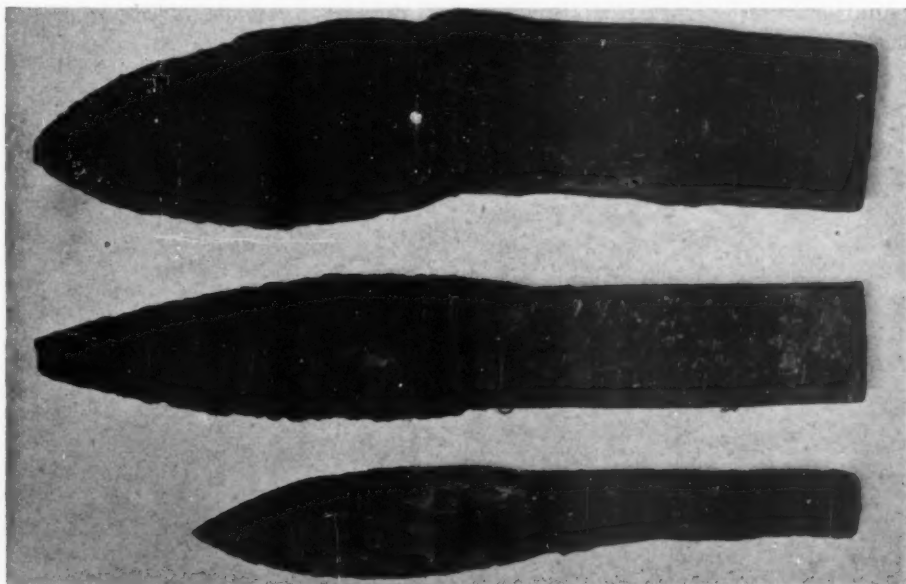
attached to the ears, while strand after strand of beads of stone and shell encircled the neck, and anklets of shells surrounded the bones of the lower limbs.

The smallest beads are disks of black stone one twenty-fifth of an inch in diameter, about three thousand of them making a strand six feet in length. Another mass of thirty-one thousand was sifted from the earth and restrung into a strand fifty-seven feet long. These beads are of the same material as the former, but of slightly greater diameter. From these tiny specimens the disk-shaped beads range in size up to pieces of turquoise as large as one's thumb nail. Marine shells were worn in great numbers, *Olivella* shells, pierced and strung whole, *Conus* shells truncated and worn suspended bell fashion, and abalone shells cut into great iridescent disk pendants. Some large disks of shell were covered with elaborate mosaics set in pitch. A disk

of pink stone formed the central element of each design. This was surrounded by narrow concentric rings of turquoise, gilsonite (commonly but erroneously called jet), and galena crystals, repeated in the order given until the periphery of the shell was reached. Turquoise and gilsonite were fashioned into representations of frogs and insects, and skillfully mounted with gum upon thin bone backings which were grooved on the inner side so that the ornaments might be strung on a cord like beads.

The skill with which the minute beads were drilled, and the masterly execution and beauty of the mosaic ornaments, mark the prehistoric Pueblo artisans as jewelers of no mean ability, especially when it is remembered that they accomplished their ends without the aid of metal tools.

The bodies which were placed in room 41 were not covered with earth by human agencies. Long after their



What are commonly supposed to have been spear points were the blades of knives. Three have been found with their wooden handles intact, one in a rat's nest, the other two buried upon the breast of a woman. The keen blades of agate or quartzite were cemented with pitch into slots gouged out of the ends of the handles, which were strengthened with a wrapping of cord or sinew that extended a short distance upon the blades. The keenness of the blades and the rigid attachment of the handles made these implements effective tools or weapons, as necessity might demand

burial, the second story room above them was used as a granary. Fire of unknown origin burned away the ceiling beams beneath the granary, and several hundred bushels of corn fell down upon the burials. Naturally the corn caught fire, and the terrific heat generated during the carbonization of the cereal damaged many of the shell and turquoise ornaments, and completely destroyed whatever wrappings and textiles may have shrouded the dead.

While the greater numbers of specimens were taken from burial chambers, many scientifically important objects were recovered elsewhere. Most of the rooms of the east wing contained large quantities of refuse which had been dumped into them by the occupants of other quarters of the pueblo. Such quantities of material could not accumulate and be cast aside without including a good many articles that would not have been intentionally thrown away. Some beautiful bits of handiwork were sifted from this rubbish, beads, pendants, one shell brace-

let set with an inlay of turquoise, and a few hammered copper bells, being the most noteworthy.

It is evident that in artistic appreciation and manual skill no Pueblos before or since have surpassed those of the Aztec region. During the very long life cycle of this culture center indigenous arts and crafts were developed to a very high degree, especially architecture, ceramics, textiles, and the manufacture of jewelry. Although surrounded by wide stretches of mountains and deserts, these Pueblos were not isolated provincials like their neighbors of the Mesa Verde, but were familiar with distant lands whence they obtained through primitive commerce things of beauty and usefulness not afforded by their immediate environment, among which may be mentioned turquoise from the valley of the Rio Grande, copper bells and macaw feathers from Mexico, ornamental pottery from southwestern New Mexico and Arizona, and sea shells from the Gulf of California and the shores of the far Pacific.



Graceful bird-form vessels, each with a head in full relief, doubtless were intended more for ornamental or ceremonial use than for direct utility. About thirty thousand beads were buried in the representation of a turtle-dove shown at the right

Samuel Wendell Williston (1852-1918)

By ONE OF HIS STUDENTS

TO HAVE been one of Williston's students was a greater privilege than most men and women at the time realized. Students worked with him, feeling that he was one of them, unaware of marks to be gained, but impelled by the interest of the subject in hand and fired by their leader's enthusiasm. Ever helpful, he was slow to censure, and quick to recognize and encourage good work. Unconsciously he inspired those he taught to emulate his achievements, and many are his students who have distinguished themselves in medicine or science.

Dr. Williston was equipped with a wonderfully trained, analytical mind, he was quick to determine essentials, to follow logically lines of development, and to deduce salient facts. But, having arrived at results, he was careful to separate facts from probabilities, clearly stating reasons where evidence was faulty, that others might not be misled. Eminently fair in admitting the opinions of others, he was an ideal investigator.

He was born in Boston, Massachusetts, July 10, 1852. While still a small boy, his family moved to Kansas, then a frontier state, and settled at Manhattan. His early education, lacking the facilities of modern common schools, was acquired under conditions that would have discouraged any mind less determined. He tells us that he learned his letters from the name and description in cast iron on the front of the kitchen stove. While a youth, he gained much experience in railroad construction, helping to survey one of the first railroads in his part of the State. Studying in a doctor's office later, he became convinced that he must have a college education. At the Kansas State Agricultural College he received the degree of B.S. in 1872 and A.M. in 1875. There, under the influence of Professor Benjamin F. Mudge, the great explorer

of the natural history, geology, palaeontology, and economic resources of Kansas, his career as a scientist was determined. He was field assistant to Professor Mudge in several exploring expeditions.

In 1876 he went to Yale University as assistant to Professor O. C. Marsh, and here he obtained the degrees of M.D. and Ph.D. He became demonstrator of anatomy, then professor of anatomy, and was health officer in the city of New Haven from 1888 to 1890.

In 1890 he was called to the Kansas State University as professor of historical geology and anatomy, and later was also dean of the Medical School which he organized. This was the period during which his influence was most felt by student bodies. In state educational matters he was a wise counselor and an originator of methods and practice. When the Kansas State Geological Survey was organized in 1895 he was placed in charge of the department of palaeontology and was influential in determining the high character of the work done. Many of his discoveries of fossil marine reptiles were brought about in relation to this work.

Although loath to leave his work in Kansas, he felt that the offer of the University of Chicago permitted greater opportunity for research, and he accepted the chair of professor of palaeontology there in 1902, a position which he held until his death in August, 1918.

In Chicago his class work was with graduate students, and during the first six years he continued publications on Cretaceous reptiles. During the last ten years he devoted most of his life to securing and describing a vast series of North American Permian fossils, and at the time of his death was engaged upon a general work on reptiles.

—BARNUM BROWN.

The Demand for Cheap Food

By L. H. BAILEY

From an address given at the dedication of the Administration Building, New York Agricultural Experiment Station, Geneva, New York, August 31, 1918

EVERYONE of us looks to the improvement of agriculture in the reconstruction period which will follow the war. We are concerned that agriculture shall have proper attention when again we put together a society that is now shot to pieces. We want to keep our schools in which agriculture is taught, our colleges of agriculture, our experiment stations in which truth is discovered. Very good: we shall improve the occupation; yet agriculture cannot take its proper place in human society by internal improvements alone. We must have a new kind of public view on the question. The larger remedies lie with the people.

THE STANDARD OF LIVING

The past generation has been known by its attention to the standards of living. We recognize that there can be neither democracy nor effectiveness without sufficient income to enable the citizen to acquire the essential goods of life. The tenement system has been overturned. The sweatshop is being abandoned. Slavish piecework has been virtually eliminated. Child labor has been made illegal. We are standardizing the wage, the length of the day's work, the conditions under which labor is performed.

The justification of all this effort lies in the human result. We are willing to pay more for pig iron, for shoes, for furniture, for books, for transportation, if only the fair standards of living can be maintained. No one raises a voice for cheaper workshop commodities for the benefit of the consumer and at the expense of the worker. Yet the public still wants cheap food.

We go even farther than this with the workshop products. By every means we endeavor to eliminate the risks of workers. The compensation laws, and various insurance plans, are of this order. We recognize that society cannot be stabilized unless the workingman is protected and his personal hazards reduced to the minimum. Yet the farm people, far outnumbering the factory

men and producing our fundamental supplies, work always and necessarily against the hazards of nature and carry the risks imposed by the Almighty. These risks cannot be averted; but society must carry the insurance.

The demand for cheap food is fallacious. Pressing down the cost of food has one or all of three results on the producers of it (and its effect on the producers is a vital concern with us as citizens of a state): we reduce the standards of living of the producers in our own country; we exploit the cheap labor and cheap lands of new and remote countries; or we live on the products of peasantry in other countries. These three are the same, considered in the human result. If we are glad to meet the problem of maintaining the standard of living for workingmen, we must be equally glad to maintain it for farmers. There are reasons why we should not attempt the same program for farmers as for workingmen: our problem is to be willing to pay as much for farm products as is necessary for the maintenance of the standard of living on the farms.

We are building great fleets. Every soul of us is glad of it and proud of the enterprise. We rejoice at every new launching. The submarines will not sink these fleets. After the war we must find water to sail them on. We are looking forward with much anticipation to the extensions of our commerce. We shall send away our manufactured products. We shall bring back the raw products, much of it in foodstuffs and hides and other agricultural supplies. Shall we be alert to see that the farming people are as well protected as are the industrial people? We can run no risk of lowering the standards of income on our millions of farms.

As a whole the public appears to be careless of the standards of living on farms. We demand cheap food in the interest of the consumer. Many discussions in the press, on the platform, and in conference, might be cited as indication. I content my-

self for the moment with a reference to an interesting discussion of the importance of importing Chinese labor to reduce the cost of food, appearing lately in a magazine. It is representative of a class. We may lay aside the agricultural misconceptions of this and similar articles. "A million such laborers," the article says, "distributed throughout the country would so increase the food supply and so lower the cost of the necessities of life that the laborer who now earns \$3 a day would then be able to buy for \$3 more food than he can get for \$5." I do not think any such result could be attained; but even if so, is it safe and worth while (except possibly as a war experiment) to produce food in North America on a Chinese scale of living? It assumes that "the average American does not like farming. The sons of the prosperous farmers do not take kindly to the tilling of the soil with their own hands. They prefer the excitement and the diversions and the stimulus of the life of city and town, and they leave the farm for the office and the factory. The average American laborer also finds the occupation of the city and town more congenial than farm labor. . . . The same reasons that have denuded the farm of labor have denuded the household of servants." Labor goes where it is best paid and most secure. It is not controlled very much by sentiment. It would go from city to country if the inducements were sufficient. And as for servants, it is the hope of democracy that all persons may better themselves. This writer affirms that the Chinese laborers would relieve the native laborers, allowing them to find employment elsewhere. This statement of the case is its condemnation. We cannot have a democracy with two very unlike standards of living in the producing populations,—an American standard for the industrial workers and a Chinese standard for the agricultural workers.

And now I come to the most dangerous fallacy of all,—to the notion that food production is only an economic question, and that our problem is to produce the greatest quantity at the least cost. Human success and democracy require the best development of the individual as a starting-point. The first crystallization of democracy is in the home. Without the training, free coöperation, and discipline of the home, there is no democracy. Farming is preëminently the

occupation of home making. The home is part of the farm. We speak habitually of the "farm home." The workingman does not domicile in the shop nor does the manufacturer live on the factory premises. The purchaser of a farm looks always at the residence as part in the valuation. The purchaser of a factory or a steamboat does not inquire about the residence of the owner: he may not know where the residence is; it may be in another city, or the owner may live in a flat where it is agreeable to neither the landlord nor the janitor that he have a family large enough to constitute a school in democracy. No public action is justifiable that so lowers the standards of income on the farm as to lessen the fullness and the protection of the home. Verily, these homes are of the backgrounds. All the responsibility and the permanence of the occupation enter into the farm home.

The service of the farmer to society is not merely as a producer of supplies. The rural range is a type of life, and one of the seedbeds of citizenship. It is our nearest approach to a permanent society. It does not move itself in search of work, nor ever find itself out of employment, nor is it ever closed by strikes or lockouts, not even temporarily suspended by commercial conditions. It is as much a part of the order of things as the face of nature against which it works. The standard of living maintained in these backgrounds is therefore an elementary consideration in the welfare of society.

We are to be convinced, therefore, that it is at least as important to maintain standards of income in the open country as in the industrial pursuits. It is the public temper to blame the farmer himself if his standards of living or his efficiency are not high in any case, saying that he is ignorant and ambitionless. We do not say it in the same way of the industrial workers. This assumption that the fault lies with the farmer is really at the bottom of much of our legislation and is responsible for a wide extent of loose thinking. Certainly we must make better farmers. All progress rests on personal excellence. Certainly also must we not make farmers the wards of society as we seem to be doing with the workingmen and for which the workingmen themselves will suffer in the end. But we must be ready and glad to pay for food what it costs to produce it plus a good living margin.

It will now be asked whether the standard of living is not, in fact, sufficiently high on the farms. I am not today discussing the family standard itself, but only the income without which it cannot be high enough to meet the needs of democracy. We recognize the high type of character bred by our best farms, and the generous scale of living there maintained; yet this does not release society from its part of a plain obligation. We may at once dismiss the glowing accounts of a class of popular writers, who would make us believe that farmers are the best off of our people. Nor am I especially considering the conditions of war time. We are to remember that the farmer does not make a profit in the commercial sense. He receives a return for his labor. I know that there may be exceptions, and not all that is classed as farming is really such. The exceptions prove the rule and they never can become the rule; and some of the profits attributed to farming are the results of speculation or the selling of fertility long stored by nature in lands only recently opened.

The fairest way we know to measure the farmer's net earning is by means of the labor income. This is the sum left after all working or business expenses and the interest on the investment and the unpaid family labor are deducted. It represents the income the farmer receives for his labor, beyond what home supplies he may use from the farm itself, which supplies are, of course, subtracted from his potential sales. Probably for the country as a whole the labor income will not exceed about one dollar a day. If it rises to twice this figure, the price of land begins to increase.

THE COST OF FOOD

We are justified, of course, in reducing the cost of food by such means as will not endanger the plane of living of those who produce it. We shall learn how to eliminate many of the extrinsic costs between producer and consumer. We shall supply the farmer more knowledge of his occupation, eliminate the incompetents, stimulate helpful organization, and in other ways improve the business itself. Never shall we need to cease such efforts. How far we can apply to agriculture the so-called efficiency methods of quantity-production of the factories yet remains to be determined. We are to consider the results on the homes as well as in

commodity wealth. The copartnership and corporation plans of farming have not been successful, and there is little hope that they can succeed outside exceptional circumstances. The private farm colony plans are foredoomed, also, except perhaps in an unusual condition now and then.

Many persons not on farms expect that farming must lend itself to the big-business type of organization, with expert management on a large scale and intensive departmentalizing of the business. This subject I am not to discuss here; I wish only to point out that even if it were to succeed, we could not expect to reduce the cost of food thereby. As soon as farming is industrialized, the home element is eliminated, all labor must be hired outright, the going wage must be paid, and salaried management must be met. At the same time we are facing lessened fertility. All this would at once greatly increase the costs. At present much of the effort in food production receives no direct wage, for women and children contribute to it. Even if the farm women do not labor in the fields, the keeping of the farm home (which is part of the farm business) devolves on them, as well as much of the management and oversight. All the efficiency methods we could apply on the workshop plan probably would not offset the unpaid or insufficiently paid labor available under the present organization and methods. The world has had cheap food because we have not paid those who produce it and have lived on stored or original fertility.

I see no hope for cheap food, on the old basis. That basis is gone forever. No longer do we look for cheap lumber or cheap paper or cheap clothing. We know that new levels have been reached. We know that new adjustments will have to be made, and that if the consumer suffers, other remedies must be found than merely to force down prices. If the cost of food is too high for the consumer, the subject is of course open to investigation, but we are not to assume that a penalty is to be applied to the producer.

In the past we have been able to obtain cheap food in this country in great abundance, because of our vast extent of very fertile land. We can no longer live on the easily stored riches of the soil. Much of the farmer's income goes back into the soil to improve it. Reduction of his income means

soil robbery; this means an impoverished people. Pinching the farmer is pinching the land. For a time, perhaps, we could maintain ourselves by importing the produce of new lands in other parts of the world; but the day could not be far distant when we should find ourselves faced with disaster. To maintain the producing power of its land is the first responsibility of any people in this century. No longer can we expect to live by foraging, by chance, and by skinning the earth.

THE RECONSTRUCTION

In all the plans and prophecies for the reconstruction of society, I see nothing that places the agricultural situation in its proper proportion. Agricultural affairs must play a prominent part in international relations. We are sending abroad commissions and agencies to review situations, but little to study agriculture in its international aspects. It will be inexcusable if, when we try to bring the peoples together again, we shall not consult the opinion of those who till the earth and produce the supplies for the support of all of us.

Certainly, also, we shall need a body of experts, raised for the purpose and acting under national authority, to study agriculture in terms of reconstruction.

In spite of all our education in agriculture and our fondness for quoting the crop figures in the world's finance and the departures we have fostered here and there, we are apparently not yet in sight of comprehensive cohesive agricultural policies. We are yet in the epoch of doing pieces of work, not having arrived at the visualizing of a society conditioned on the earth.

In the meantime, capital and labor are vocal. Many interests are planning definitely for reconstruction. The boldest pronouncement yet made on the reconstruction of society is the report of the Subcommittee of the British Labor Party, proposed for consideration by the party. It is a clear, definite program. It is ambitious, striking at fundamental considerations, and holding no reverence for traditions. Because of its definiteness it will make headway.

Yet this great program, although mentioning the land and the farmer incidentally, virtually ignores the agricultural range as a concept in the social order. Even though it proposes to broaden the Labor Party in Eng-

land to include "all workers by hand or brain," yet it practically excludes many of them by holding to the panacea of labor organization and control. This self-sufficiency seems to be characteristic of the attitude of the group we know as "labor." It assumes that it speaks for society, and that it holds the magic for democracy. It is proposed to "build society anew," and "what the Labor Party intends to satisfy itself about is that each brick that it helps to lay, shall go to erect the structure that it intends, and no other." This sounds like intolerance and dominion, and is anti-democratic in its expression. The tenor of the report is to assume the right of way for trade-unionism, even as against government.

What we speak of as "labor" is a minor element in society as compared with the farm element. Probably even in Europe it does not represent more than 20 per cent of the population as against perhaps 50 or more per cent of the agriculturally rural population. Probably 75 per cent of the world's population is yet pastoral and agricultural. The major part of the population can never be industrialized. These rural people are neither industrial workers nor capitalists; or, rather, they are a combination of the two. They constitute a great buffer range of the people that are not yet set over as antagonists against other ranges. They lie outside the usual classifications of "workingmen" and "brain workers" and do not come within the vision of the Subcommittee's report when it declares that "the policy of the Labor Party in this matter is to make the utmost use of the trade-unions, and, equally for the brain workers, of the various professional associations."

It is not my purpose now to analyze this great program. I am in sympathy with much of it and with the evident needs of the workingman. I admire its statement of the case. We must largely accept its underlying philosophy that social and economic values belong to society; we foresee a vast enlargement of its desire for a share rather than for wages. I wish only to use the pronouncement as illustration of the ease with which we overlook the rural side of society in our great plans of social reconstruction. This reconstruction must not rest alone on the demands of the workshop, nor on "employment," nor on wage scales, nor on profit-sharing. The attitude of "labor" toward the

day's work can never be that of the farmer. There are wider ranges of the population in which unemployment is not a major problem. Nor am I convinced that its "democratic control of industry" would be much more than its control in the interests of labor and urbanism.

Nor, again, does the "common ownership of the nation's land" provide a solid foundation. The production from the earth does not rest on the same natural necessities as does the manufacture of commodities in the workshop. The ownership of land provides the program that in the industries is supplied by the organization. We shall find the peasants of Russia dissatisfied after a time with any plan of public ownership of all farm land; the farmer naturally desires to own his farm. Such private ownership does not carry the menace to society that may be carried by organized or corporate industries.

THE PROBLEM

Now we are ready to agree, I trust, that we have before us a politico-social question of the first magnitude. The problem is not measurable by statistics (nothing expresses so little, and obscures so many facts, as figures). The trouble with society is its enmities and antagonisms. For fifty years, the great antagonism has been between capital and labor. This problem still overshadows all others. We think we begin to see solutions in the legacies of the war. But there arises another antagonism, between the consumer and the producer. This has grown with our urbanism and with our relative neglect of the rural civic and social problem. If the consumer and the producer develop attitudes of hostility to each other, it will involve the whole of society and split it wide open. It will raise an agrarian question of far greater danger than the political agrarianism of some of the other countries. The immediate task before us is to put these great questions before the consumer with fairness, sympathy, and all candor. If we are to make the most of our responsibilities, here or anywhere, we must come into harmony on the question of the supply of food. This means a real coöperation in spirit and in practice between the producer and the consumer, with a determination on both sides to avoid the hateful enmities that have riven society in the name of capital and labor.

THE APPLICATION

Today we celebrate at an experiment station. What is its relation to our problem?

Its primary function is to aid in the increasing of production by contributing knowledge and the confidence of science. While we are feebly debating the ways of getting cheap food, we are running straight into the problem of obtaining food enough at any price. We cannot forever scatter over the earth and pick up our supplies. Labor is becoming mobile, agricultural labor with the rest; it goes where rewards are greatest, and this means that rural labor goes to cities and to industries; the great government-controlled industries of war time and thereafter will hasten this movement. Democracy, for which we are fighting, will release the serfs and unchain the castes; the land may suffer. Population is increasing. The standards of life are rising. The maintenance of armies utilizes great tracts of land that might produce crops. The people waste their supplies. We look to new areas of virgin land to make good our needs, but this only defers the issue and breeds incompetence in the people; it is a weakening policy.

This skill must be paid for. If we are to educate the farmer to greater effectiveness as an occupationist and to increase his training as a citizen, we must see that he is able to get the value of his education and to have the essential advantages of life. Rather than try to force down the cost of farm supplies to old levels, we must remember that these old levels have often been too low and that our problem now is to place them where they belong in relation to other values.

To develop skill in the farmer requires institutions with good equipment, the best and ablest investigators and teachers, freedom of these officers to devote their best efforts to their work rather than to be diverted by governmental interferences, patience on the part of the people to wait for results that come only in their due time and season. You say this costs money. Yes, much money. You would not appreciate the work if you did not pay what it is worth. We are now destroying property and supplies. I suppose that more money and treasure are being expended this day in destruction than have been appropriated for agricultural research in the history of the world. We have not yet passed the destructive phase of our evolution.

The Platinum Situation in the United States

WHILE, during the Great War, the use of platinum for catalyzing processes in the production of concentrated sulphuric acid for the manufacture of explosives, for dehydrating nitric acid, and for aeroplane and other war machinery, has been made especially prominent, the wide employment of it in electric appliances of various kinds is at least of equal importance. Large amounts of platinum have been used for dental work, because of its durability and its resistance to the action of acids. The latter qualities have made it of the greatest possible value also for various chemical vessels, such as crucibles and retorts. Within the last ten or fifteen years it has been employed by manufacturing jewelers in many ways, such as for watchcases and for other of the smaller ornamental pieces, and for precious stone settings, more especially for diamond settings.

Because of the increasing demand for platinum in the war industries, the War Industries Board decreed that after October 1, 1918, the use of this metal in the manufacture of new stocks of jewelry or for other nonessential purposes should be prohibited. The same law applies to iridium, palladium, osmium, ruthenium, rhodium and compounds thereof. It is said that the Government has a sufficient supply on hand after commandeering the stock of unmanufactured metal, and the prohibition, therefore, does not extend to platinum jewelry already made up, which can be sold as heretofore—that is, by manufacturers or dealers licensed by the War Industries Board. The decree is the result of a special emergency act to effect Government control over platinum, iridium, and palladium, passed by Congress October 6, 1917, and amended July 1, 1918. The situation at that time, after a careful survey, was recognized as serious. Platinum in the United States sold in 1890 at \$16 a troy ounce and is selling now at \$105 a troy ounce, five times the cost of gold. This situation arose directly from the embargoes of 1915 put upon exportation from the countries at war, England, France, Germany, and Russia, and from the practical cessation of the Russian supply, followed by increased demands after our entry into the war. Prior to the war, Russia had

furnished 95 per cent of the world's entire stock. The cutting off of the Russian supply, the principal source of the metal, the imperative need for it for war purposes, and the consequent stringent measures taken by the various governments to restrict its exportation, have operated to limit its use greatly, and have also induced an active search for substitutes which might prove more or less satisfactory. To this end alloys of gold and palladium, gold and osmium, or gold and nickel have been used with fairly good results in many cases. The shortage has also stimulated the search for platinum, not only in the metallic deposits of various parts of the United States, but throughout the entire world, and several new, minor sources have come to light. It is possible that a change in metallurgical methods may furnish a quantity of platinum and palladium in place of that not now available from Canadian sources, and that the resources of the United States and Colombia may be developed to greater extent.

There is good prospect from the development of deposits in Japan, where a considerable amount of platinum and palladium has been obtained by electrolysis from certain copper ores. Brazil also offers good and constantly improving prospects; here platinum is to be found in a number of localities, often combined with palladium. Tasmania has recently sent out a notable amount of osmiridium, one of the allied platinum metals and one of the most useful substitutes for the latter in many of its uses. The copper ores of Canada, especially those of Sudbury, Ontario, can be made to supply a very large amount of palladium and a considerable quantity of platinum also, by systematic treatment. In all these regions, however, except the last named Canadian locality, the deposits are widely distributed, and many new ones must be added to those already reported in order to give full promise of an important addition to our much needed platinum supply. Unquestionably, if our best hopes should be realized in the constitution of a newly and firmly organized Russia, that land will again be able to resume her platinum output, although the necessity for seeking new and promising fields will in no wise be lessened

by this, as we have always to bear in mind the prospect of a natural diminution of the Russian deposits, which have been so long and so extensively exploited. Should the new region in the Ronda Mountains, Spain, come up to the expectations when, by the removal of the economic obstacles incident to the war, the requisite capital and energy shall have been directed thither, this field also may come to be a source upon which we can count for excellent results.

Of the 5,000,000 or more ounces of platinum already in existence, it has been estimated very conservatively that catalyzing processes have claimed 500,000 ounces, dental uses 1,000,000, chemical apparatus 1,000,000, electrical devices 500,000, and jewelry 500,000. These estimates are probably set rather too low in view of the fact that the total production of the metal has certainly been as much as 5,000,000 ounces; indeed some authorities have placed the total Russian production alone as high as 7,000,000 ounces. This was crude platinum, of course, and would furnish only about 5,800,000 ounces of the refined metal.

In the period from 1900 to 1917 the imports of unmanufactured platinum and of bars and ingots into the United States, have had a total weight of 52,767.2 kilos, or approximately 1,696,711 troy ounces, and a total value of \$48,981,879. To this must be added imports of crucibles, retorts, and the like, worth \$2,302,236, giving a total value of platinum in all forms of \$51,284,115. Of course, a good proportion of the import was crude platinum. For the fiscal year ended June 30, 1918, the imports of unmanufactured platinum, and of bars and ingots, weighed 1613.1 kilos, or 51,862 troy ounces, and were worth \$4,572,614; the retorts, vases, etc., were valued at but \$2547, giving a total of \$4,575,161 for all platinum imports to the United States. Of this Colombia contributed \$2,241,744 (27,030 troy ounces), just about one half of the total value and a little more than one half the weight. A single special shipment of 21,000 ounces from Russia, acquired for \$2,000,000, accounted for most of the remainder.—
GEORGE F. KUNZ.

Notes

SINCE the last issue of the JOURNAL, the following persons have been elected members of the American Museum:

Life Members, MISS MARIE LOUISE PECKHAM, LIEUTENANT HARRY F. GUGGENHEIM, MESSRS. H. BENIS, CHARLES WATSON BOISE, EVERETT MASTEN, and ALBERT HOUGHTON PRATT.

Sustaining Member, MR. GARDINER H. MILLER.

Annual Members, MESDAMES LYNDON CONNETT, R. G. HAZARD, JULIE KAHLE, R. S. KOCH, ROMAIN A. PHILPOT, R. LLEWELYN REES, MISSES MARY ALLEN, SARAH M. POST, MESSRS. RICHARD M. ANDREWS, FRANK CARLSON, ALBERT J. ERDMANN, CHARLES J. FAY, JOHN W. FROTHINGHAM, LOUIS B. HUBBARD, ROBERT PARKER LEWIS, EDWIN F. O'NEILL, ARTHUR SMITH, SIDNEY SMITH, and BRET H. WHITMAN, JR.

Associate Members, MESSRS. G. W. MC-FARLAND, L. H. SOMERS, and DWIGHT WINTER.

THE Board of Trustees of the American Museum, at its meeting on November 11, adopted a resolution electing to life membership Mr. Albert Houghton Pratt, in recognition of his gift of negatives and motion pictures to the educational work of the Museum. Lieutenant Harry F. Guggenheim was also elected a life member in recognition of his generous contribution to the anthropological department.

THE British Educational Mission to the United States, composed of distinguished representatives of the universities of England, Scotland, and Ireland, was entertained at luncheon by the trustees of the American Museum on October 10. The Mission came to this country to develop, if possible, closer coöperation between British and American institutions, and to strengthen the bond of sympathy and understanding between the two nations. At the close of the luncheon the party made a tour of inspec-

tion of the exhibition halls of the Museum. Much interest was manifested in the Jesup collection of North American woods, and the Darwin hall elicited praise for the skill manifested in the preparation of specimens, especially those dealing with public health problems. The food conservation exhibit was studied, and in the department of education the nature study collections and the method of coöperating with the classes for the blind and with the city schools and libraries received special attention. The members of the mission were: Dr. Arthur Everett Shipley, Vice Chancellor, University of Cambridge; the Reverend Edward M. Walker, fellow and librarian of Queen's College, Oxford University; Sir Henry Miers, Vice Chancellor, University of Manchester; Sir Henry Jones, professor of moral philosophy, University of Glasgow; Dr. John Joly, professor of geology and mineralogy, Trinity College, Dublin; Lieutenant Robert Nichols, Oxford University; Captain H. A. Smith, fellow of Morgan College, Oxford University.

C. S. PIETRO, Italian sculptor, whose work is represented in the American Museum by the busts of John Burroughs and Charles L. Sargent, died of pneumonia at his home in Pelham Manor, New York, on October 9. When taken ill he was engaged on a piece of sculpture intended as a gift to France, believed by some to be his most important work. Mr. Pietro was born in Palermo, Sicily, and studied art in Rome. He came to the United States ten years ago, at the age of twenty-two. Other works executed by him are portrait busts of John Muir and Charles R. Van Hise in the University of Wisconsin and of J. P. Morgan and Elihu Root at Harvard University.

MR. CARL E. AKELEY, of the American Museum, has devoted all of his time during the last eighteen months to matters pertaining to the war and service to the United States Government. One of the enterprises has been the manufacture of the Akeley Motion Picture camera, an instrument originally designed by him especially for use as a naturalist's field camera. Photography as it has had to be carried on at the front during the Great War has presented conditions so nearly paralleled in peace times by the conditions accompanying big game hunting

that it was quite natural for the Government to turn to this particular camera and adopt it as an instrument of military service. The camera had not been manufactured commercially previous to the participation of the United States in the war; Government orders, therefore, made it necessary to establish a factory, the entire output of which up to the present time has been delivered to the United States Army.

Mr. Akeley, as consulting engineer in the Division of Investigation, Research, and Development of the General Engineering Depot of the United States Army, also has been called upon for service in the development and production of many mechanical devices in connection with field searchlights, sound ranging instruments, and other war-time apparatus. He has been special assistant to the Chief of the Concrete Ship Division of the Emergency Fleet Corporation, a position for which he was especially well qualified from his experience as inventor of the cement gun, recognized as an important tool in the construction of concrete ships. In addition, an extensive line of experiments with concrete has been carried on in connection with the Bureau of Standards at Washington for the purpose of determining the combinations which would result in a medium embodying maximum strength with minimum weight.

While in the midst of these interests, Mr. Akeley conceived, and with the sanction of President Henry Fairfield Osborn of the American Museum of Natural History, worked out the details of a plan whereby the American Museum building with all its tremendous resources and peculiar fitness for such service might be placed at the disposal of the United States Government for use as a convalescent and rehabilitation hospital for disabled soldiers. In the development of his idea Mr. Akeley pointed out that should the Government decide to accept the offer, there were unique possibilities not only in the building itself for easy conversion into hospital wards without retiring any large number of exhibits, but also in the resources at command through the service of the staff of instructors and artists and the equipment and facilities of laboratories, studios, and shops, for mental entertainment of patients and industrial occupation of convalescents. The details of the plan were elaborated by a special committee appointed by President

Osborn, consisting of Dr. C.-E. A. Winslow, Dr. R. W. Tower, and Mr. Akeley. The matter is now awaiting the final decision of the War Department.

IMPORTANT explorations in the Huerfano Basin, Colorado, have recently been completed. This little mountain basin is situated in a recess of the Front Range not far from Pueblo. It is of interest to paleontologists as a few fossil teeth and bones had been found in it of geological age apparently between the better known Bridger (Middle Eocene) and Wasatch (Lower Eocene) faunas. It was first explored by Mr. R. C. Hills, of Denver, and subsequently in 1897 by Professor H. F. Osborn and Dr. J. L. Wortman for the American Museum. In 1916, Mr. Walter Granger, assisted by Mr. George Olsen, undertook a more thorough search for fossils which was completed this summer, 1918. The collection obtained is a considerable one, although mostly fragmentary, and will be of much scientific interest. The best specimen in it is a very perfect skull and jaws with part of the skeleton of *Tillotherium* (a rare extinct beast which looked a little like a gigantic rodent but was not at all related to the true rodents) discovered in 1916 by Mr. Olsen. The formation in which these fossils are found is a volcanic ash or tuff of about five thousand feet thickness, indicating the considerable and long sustained volcanic outbursts which must have taken place in this region at the time when the Huerfano mammals flourished. The stratigraphy of the formation was carefully studied by Mr. Granger, accompanied during part of the time by Mr. Hills, who has devoted many years to the study of the geology of this vicinity, and who is at present curator of geology and mineralogy in the Colorado Museum of Natural History. The scientific results of the Museum expedition will be published later in the *American Museum Bulletin*.

THE establishment of the Katmai National Monument by executive order of President Wilson, dated September 24, 1918, is regarded as the first step in making this remarkable region of Alaska accessible to the public as a national park similar to Yellowstone and Yosemite. The area embraces the Valley of Ten Thousand Smokes,

the volcano of Katmai, and considerable outlying territory. It was visited last summer by one of the expeditions of the National Geographical Society.

MR. WILLIAM DE C. RAVENEL has been placed in immediate charge of the administration of the United States National Museum at Washington with the title of administrative assistant to the Secretary.

THE Mission of the French Scholars to the United States visited the American Museum of Natural History on November 12, accompanied by Dr. William H. Carpenter, provost of Columbia University. The Mission was received in the Board Room by Professor Henry Fairfield Osborn and members of the scientific staff and then proceeded on a tour of inspection of the educational methods employed by the Museum in handling its exhibits. The members of the Mission included: Dr. Theodore Reinach, of the Institut de France; Professor Emmanuel de Martonne, of the University of Paris; Professor Fernand Baldensperger, of the University of Paris; Professor Charles Cazamian, of the University of Paris; Dr. Etienne Burnet, of the Pasteur Institute (Paris); Mr. Charles Koechlin, composer and critic of music; and Mr. Seymour de Ricoli, art critic and secretary of the *Gazette des Beaux-Arts*.

FOR several months past a series of experiments with various patterns of life preservers have been conducted at the New York Aquarium by a committee headed by Director C. H. Townsend. The tests have been made after the building was closed to visitors for the night, the large sea water tanks serving admirably for observation. First the flotation of the life preserver as worn by a fully dressed man of average height was tested; sufficient weights were then attached to its lower edges to maintain it at a water line marked while it was in use and it was then left to float for twenty-four hours or longer. It will be remembered that the first vessel to reach the scene of the "Titanic" disaster found only one body afloat, although bodies with properly attached life preservers continued to come to the surface for several days. Naval officers and steamship men have been present at the experiments, but so far the details of

the report have been submitted only to the authorities at Washington.

THE final results of the Museum's investigation of the archaeology of the Zuñi tribe are soon to be published in the *Anthropological Papers*. This concludes one section of the Museum's extended studies of archaeological and ethnological problems in the Southwest. By a reconnaissance of the ruins in the Little Colorado River drainage, which takes in a considerable area in Arizona and New Mexico, Mr. Leslie Spier has been able to trace tribal movements in the western part of the Pueblo area. He finds that about the time the Indians gave up living in small, isolated dwellings and began to build the great communal houses or pueblos, there were two tribes living in this area, one in what is now the Apache country in the White Mountains of Arizona and the other near the present Zuñi pueblo in New Mexico. After a period of parallel development, the New Mexican group left the area, while the White Mountain group moved north to the Little Colorado where they presumably joined the Hopi Indians. Again after a period of common development the Zuñi left this group, moving northeastward to their present location, while the Hopi seem to have left the river for the northern Arizona desert. On the basis of this historical sketch of Mr. E. H. Morris' work at the Aztec ruin, and of Mr. N. C. Nelson's along the Rio Grande, the members of the Museum staff are constructing a chronology for all the archaeological remains in the Southwest.

THE fourth meeting of the American Society of Ichthyologists and Herpetologists was held at the Brooklyn Museum, November 15, 1918. Previous meetings have been held at the Museum of Comparative Zoölogy, Cambridge, Massachusetts, November 16, 1917; at the Academy of Natural Sciences, Philadelphia, March 8, 1917; and at the American Museum of Natural History, March 8, 1916. The present Brooklyn meeting was opened with an address of welcome to the Society by Director Fox of the Brooklyn Museum. Mr. J. W. Titeomb, New York State Fish Culturist, spoke of fish conservation in New York State. Dr. Bashford Dean told the Society of the late Dr. Charles R. Eastman's work on fossil fishes.

Dr. William K. Gregory, of the American Museum of Natural History, illustrated with figures of the skeletons of dinosaurs the correlation between habit, muscular development, and skeletal form. Dr. E. Uhlenhuth, of the Rockefeller Institute for Medical Research, showed how a study of the blind Texan cave salamander indicated the connections of subterranean waters, and suggested that a study of such nonmetamorphosing amphibians had an important bearing on our knowledge of the glands controlling metamorphosis.

Officers were elected as follows: president, Dr. Leonhard Stejneger; vice presidents, Dr. Bashford Dean, Dr. Barton W. Evermann, and Dr. Thomas Barbour; treasurer, Dr. Henry W. Fowler; secretary, Mr. John T. Nichols. Mr. Carl L. Hubbs, of the Field Museum, Chicago, was elected to the Board of Governors.

MR. ROY C. ANDREWS, leader of the Second Asiatic Zoölogical Expedition, writing under date of September 18, to the president of the American Museum, describes a recent journey made to Urga, in outer Mongolia, a picturesque town made up of about 2000 Russians and 3000 Chinese, with 35,000 llamas. The trip was made by way of the many century old caravan trail across the Gobi Desert—a region not a "desert," however, but a vast rolling Siberian prairie. About 2000 antelopes were seen of three species, and Mr. Andrews states that individuals racing parallel with the automobile and passing it must, at a conservative estimate, have reached a speed of sixty miles an hour.

THE scientific results of the American Museum Congo Expedition are now being published in separate volumes of the *Bulletin*. A revision of the Vespidae of the Belgian Congo by Mr. J. Bequaert has appeared as Article I of Volume XXXIX. This volume will also include a paper by Mr. Karl P. Schmidt on lizards, turtles, etc., and one by Dr. J. A. Allen and Mr. Herbert Lang on the insectivores. An extensive paper on Congo Mollusca by Dr. H. A. Pilsbry, of Philadelphia, is in press as the first article in Volume XL.

DURING the last month Mr. Roy W. Miner, of the American Museum, has co-

operated with Dr. Robert Underwood Johnson, president of the New York Committee of the Italian War Relief Fund of America, in the work of examination, selection, and preparation for shipment of a number of compound microscopes suitable for bacteriological work, to be forwarded to Italy for use in the field hospitals. Many of the microscopes were donated, ten being given by the American Museum of Natural History. Others were purchased by the Italian War Relief Fund. Two shipments have already gone and another, the final one, is in course of preparation. The lens requirements for these instruments are important as the character of the work to be done demands a certain equipment embodying high magnifications, which the ordinary student's microscope does not often possess.

A COMMISSION on the study and control of epidemic influenza has been appointed by Governor Whitman of New York State. Dr. Hermann M. Biggs, State Commissioner of Health, is chairman; Dr. Walter B. James, vice chairman; and Dr. C.-E. A. Winslow, secretary.

IN addition to the brief description of the American Museum's work with the blind printed in this number of the JOURNAL (page 572), we give here a quotation from a letter to the Editor from Miss Frances E. Moserip, Inspector of Classes for the Blind in New York City: "It gives me great pleasure to express my appreciation of the American Museum's work accomplished in connection with the blind and sight conservation classes of the public schools. The expensive relief globes which have been furnished to all of the classes are daily a source of information and delight, not only to the blind and partly sighted pupils but also to the normal pupils who are associated with them. Several principals have told me how envious they felt that the globes could not be furnished to the whole school. You would hardly recognize some of the globes, they are so dotted with principal cities, lined with important rivers, steamship and railroad routes, and marked with mountain ranges and interesting peaks. The alternating days and nights and the changing seasons have been explained and clarified also through the use of these wonderful globes. Nothing that has been furnished to the special classes in the

schools, however, can take the place of the little excursions the children make to the Museum. On these occasions your instructors have acquainted them with Indians, Eskimos, Oriental peoples, and their interesting manners and customs. I well remember the delight of one child who took a ride on a fully equipped Eskimo sled, drawn by a dog with all his trappings. The child's imagination supplied the snow and cold and other features of a real trip in polar regions. The work in connection with the native birds and domestic animals has stimulated the child's interest in his surroundings and in the study of geography. Intimate knowledge of flowers and cereals gained at the Museum lectures is one which might never be acquired from Nature herself nor from the studies in school except in a more limited measure. Many of the older pupils, especially the high school students, have appreciated the evening lectures, and the assistance the Museum has rendered in defraying the expenses to and from both the afternoon and evening lectures has made possible the attendance of many who could not otherwise have taken advantage of them."

The JOURNAL hopes to publish in the December issue an account by Miss Moserip of her work with the sight conservation classes in the New York public schools.

MR. GEORGE CHAMBERLAIN, assistant in the department of publications of the American Museum, died on October 29, 1918, after a long illness. He was a native of England, and came to the United States in 1897, and had been in the employ of the Museum since February 6, 1909. He is deeply missed by a large circle of acquaintances and friends.

MISS MARTHA RYTHER, a well-known textile designer in New York City, connected with the firm of H. R. Mallinson & Company, is conducting a class in textile design which meets at the American Museum every Wednesday afternoon. The membership of the class is made up of designers in the textile and garment industries and members of the Keramic Society of America. The study is based upon the large resources of the Museum in original documents of Peruvian and other prehistoric textile material.

AN ARTICLE on "Ancient Peruvian Textile Designs," in a recent issue of the *British*

and *Latin American Trade Gazette*, calls attention to the adoption by United States textile manufacturers of ancient designs of Peru and speaks of the advantage possessed by this country in having large collections of Peruvian specimens in our museums. Thousands of pieces of cloth of ancient manufacture, of unrivaled technique and coloring, and displaying a great variety of original artistic designs, have been brought out of Peru by collectors. The Peruvian's mastery of the art of coloring and fixing the dye had reached such perfection that the ancient patterns have remained bright and beautiful after thousands of years. For some time past American designers have been making studies from these cloths and the patterns created have been adopted eagerly by manufacturers for both cotton and silk fabrics. The *Trade Gazette* believes that these designs will appeal with equal force to customers of the Old World. The Peruvian textile collections in the American Museum, which have been the chief source of inspiration to New York designers, number about one thousand pieces.

THE leading article of this number of the JOURNAL, "A League of Free Nations," by President Charles R. Van Hise, of the University of Wisconsin, was delivered as the opening address before the Wisconsin State Convention of the League to Enforce Peace, November 8, 1918. President Van Hise has been closely connected with America's war activities. At the request of the United States Food Administration in the early part of 1917, he prepared a course of lectures on "Conservation and Regulation in the United States during the War," which were printed and used in the universities, colleges, and normal schools throughout the country. During the summer and autumn of 1918, in company with a party of editors, he visited England and France, and as a guest of the British Ministry of Information, was granted full opportunity to understand the war effort of Great Britain both at home and in the field. The fundamental purpose of this visit, from which he has just returned, was to cement more firmly the union of English speaking peoples.

IN order to develop the scope of usefulness of the files of lantern slides on educational subjects, a representative of the

American Museum visited the New York State College of Forestry at Syracuse University recently and selected a number of negatives showing practical and approved methods of reforestation, lumbering, fire protection, and forestry in general. The courtesy of the State College of Forestry in lending its negatives for this purpose is greatly appreciated.

MR. G. K. NOBLE, research assistant in herpetology at the American Museum, enlisted as second-class seaman in the United States Navy in April. Later he was assigned to the First Naval District Officer Material School, at Cambridge, Massachusetts, from which he was graduated on October 14 with the commission of ensign.

GUIDE Leaflet No. 48, *Insects and Disease*, by Messrs. C.-E. A. Winslow and Frank E. Lutz, has been issued from the American Museum press. Much valuable information about insects and their intimate relation to health conditions among mankind is embodied in its seventy-three pages. Twenty-two pages are devoted to the common fly. Latest scientific methods of dealing with insect pests of the household, and the remarkable results which have been achieved in wiping out typhoid and other malignant diseases spread by insect carriers, are clearly set forth.

THE food conservation exhibit prepared by the department of public health of the American Museum which was on view in the gallery of the concourse of the Grand Central Station in the spring of 1918, and later formed an important part of the food show held at the Grand Central Palace in the summer, was brought back to the Museum and is now established in the center aisle of the forestry hall. This application of American Museum demonstration methods to problems of national mobilization for war service has met with wide commendation. The exhibit is pronounced by representatives of the United States Department of Agriculture to be the best food exhibit yet prepared, and its details have been studied and copied by food educators throughout the country.

THE American Museum War Relief Association, composed of employees of the

American Museum of Natural History and members of their immediate families, has issued a summary of what has been accomplished since its organization in May, 1917. Among its activities is the work of three departments under the Red Cross which have devoted themselves to the preparation of 920 bandages and 28,755 surgical dressings, and the making of 688 hospital garments and 331 knitted articles. Red Cross membership receipts during this period amounted to \$313. Garments knitted for other organizations than the Red Cross totaled 256 sweaters, 108 wristlets, 147 scarfs, 367 socks, and 137 helmets. The total amount of money raised from Museum employees and other sources was \$2,281.76 of which \$1,610.22 was expended in various ways such as for sewing and knitting materials, surgical dressings, comfort kits and knitted outfits for the Museum boys in service, and the support of one French and one Belgian orphan. A balance of \$671.54 was reported in the treasury on October 30. The Association has also collected more than two tons of clothing for Belgium and France.

CLOSE rivals to the wonderful modern improvements and inventions of warfare have been some almost forgotten weapons resurrected during the World War. Among these were various forms of armor, as exemplified in the steel helmets and trench shields used by all the armies,—the heavy breastplates of the Germans, the lighter breastplates for attack worn by the English, and the armored waistcoats of the Italians. The armor workshop at the Metropolitan Museum of Art under the supervision of Major Bashford Dean made many experiments in the manufacture of armor models for our American soldiers. This workshop, unique so far as known, was established originally for the repair and preservation of one of the greatest collections of armor in the world, including the Riggs Collection which contains some of the rarest pieces on the market since 1850. In the armor collection of the Metropolitan Museum there are about ninety kinds of anvils, several hundred types of hammers, curious shields, and instruments the very knowledge of which has today almost disappeared. All these were studied by American designers, and the ancient implements actually were used to manufacture models in the

workroom. In direct charge of the work under Major Dean, is M. Daniel Tachaux, the descendant of a long line of armorers. His skill is known to collectors the world over. Born in Blois, France, M. Tachaux went to Paris in the early seventies and was apprenticed to the famous Klein, who was brought from Dresden by Napoleon III to clean and repair the armor in the beautiful Château of Pierrefonds. Ten years ago he came to New York and was appointed assistant to Professor Dean. When war was declared and there was need of skilled workers on models of armor, this department of the Museum was placed at the disposal of Secretary of War Newton D. Baker. In November, 1917, Major Dean, because of his lifelong study of the subject, was commissioned Major in the United States Army and sent abroad by the United States Government to study the needs of the army on the Western Front. On his return late in January, he began to work out designs for armor in accordance with his observations and with suggestions from General Pershing and the Ordnance Department. These designs were carried out by M. Tachaux, and no fewer than twenty-five different types of armor defenses were made in experimental lots by various factories, numbering from a score to many thousands of pieces. They comprise all that was best in ancient armor. Helmets, shields, breastplates, and even leg guards and arm guards were made. These last were suggested by the study of hospital statistics in France and England, in which it appeared that more than 40 per cent of the casualties suffered were leg wounds and 33 per cent arm wounds. It is interesting to note that so completely were armored defenses studied in the past that there is scarcely a technical feature that was not worked out in elaborate detail by the old-time armor makers.

THE castor bean (*Ricinus communis* Linnaeus) has lately attained fame in the winning of the war, owing to the fact that the oil contained in the beautifully mottled seeds is the kind which induces the machinery of an aeroplane to do good work. The United States Government has contracted with Florida growers for thousands of acres of castor beans to produce oil for aeroplanes. The best grade of oil is obtained by hydraulic pressure.